PATENT ABSTRACTS OF JAPAN

(11)Publication number : 10-089640
(43)Date of publication of application : 10.04.1998

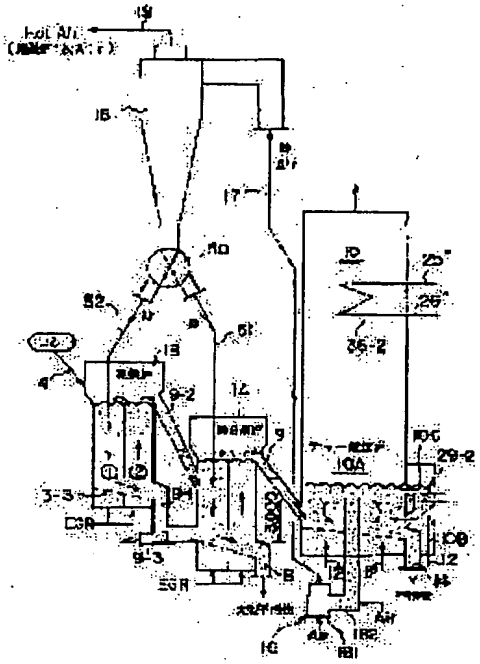
(51)Int.Cl. F23G 5/027
F23G 5/02
F23G 5/04
F23G 5/16
F23G 5/30

(21)Application number : 08-266810
(22)Date of filing : 17.09.1996

(71)Applicant : MITSUBISHI HEAVY IND LTD
(72)Inventor : HORIZOE HIROTOSHI
SATO ATSUSHI
SHIMIZU YOSHIHITO
YASUDA SHIZUO
KAWAMI YOSHIMASA

(54) INCINERATING DEVICE FOR REFUSE AND SUPERHEATED STEAM PRODUCING DEVICE UTILIZING INCINERATION HEAT OF THE REFUSE

(57)Abstract:
PROBLEM TO BE SOLVED: To eliminate the need for oxygen enriching equipment and to reduce an operation power cost by a method wherein a thermal decomposition means is formed of a fluidized bed having a plurality of fluid areas partitioned by a partition wall, and fed refuse is thermally decomposed as the refuse is being circulated through the fluid areas.
SOLUTION: Circulation fluid sand of 650° C is fed to a drying furnace 1B from a char combustion furnace 10 through an air flow conveyance mechanism 16, a cyclone 18, and branch lines 51/52. Meanwhile, moisture content-contained municipal refuse is fed through a refuse feed line 4. Slight air for regulating temperature is fed in combustion exhaust gas through a combustion exhaust gas line and the mixture is caused to flow in a circulating manner in a fluidized bed, wherein fluid sand is fluidized, by a downward flow and an upward flow. Temperature in a drying furnace 1B is maintained at 100-300° C to perform drying. Thereafter, a dried refuse mixture consisting of refuse after drying and fluid sand is introduced to a thermal decomposition furnace 1A through a line 9-2.



LEGAL STATUS

[Date of request for examination] 25.08.1999
[Date of sending the examiner's decision of rejection] 08.01.2002
[Kind of final disposal of application other than the examiner's decision of rejection or application converted registration]
[Date of final disposal for application]
[Patent number]
[Date of registration]
[Number of appeal against examiner's decision of rejection]
[Date of requesting appeal against examiner's decision of rejection]
[Date of extinction of right]

CLAIMS

[Claim(s)]
[Claim 1] The cracked gas which supplied waste with the bed material in space with a temperature of 300 degrees C or more, was made to perform a pyrolysis reaction, and occurred by the reaction, A pyrolysis means to separate the char mixture which consists of a undecomposed residue and a bed material, and incombustibles of each other, The char mixture which consists of the undecomposed residue and bed material which were drawn from the aforementioned pyrolysis means While forming including a char combustion means to burn the aforementioned undecomposed residue, with the fluid bed equipped with two or more flow regions classified by the bridge wall in the aforementioned pyrolysis means, making it flow with air The incineration equipment of the waste characterized by forming by the flow tub which performs a pyrolysis while the waste supplied to this fluid bed circulates through the aforementioned flow region.
[Claim 2] A means to dry waste under oxygen deficiency preferably at the temperature of 100–300 degrees C, Supply the waste dried by the aforementioned dryness means and make it perform a pyrolysis reaction with a bed material in space with a temperature of 300 degrees C or more. A pyrolysis means to separate the char mixture which consists of the cracked gas which occurred by the reaction, a undecomposed residue, and a bed material, and incombustibles of each other, The char mixture which consists of the undecomposed residue and bed material which were taken out from the aforementioned pyrolysis means While forming including a char combustion means to burn the aforementioned undecomposed residue, with the fluid bed equipped with two or more flow regions classified by the bridge wall in the aforementioned dryness means, making it flow with air The incineration equipment of the waste characterized by forming by the flow tub which dries while the waste supplied to this fluid bed circulates through the aforementioned flow region.
[Claim 3] The claim 1 characterized by constituting so that waste may circulate through between the aforementioned downward flow region and elevation flow regions while the downward flow region and elevation flow region which are formed of the air current control supplied from the lower part of a distributor constituted two or more flow regions classified by the bridge wall a claim 1 or given in two, or the incineration equipment of waste given in two.

[Translation done.]

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[The technical field to which invention belongs] this invention is invention about the superheated-steam manufacture which incinerates a municipal solid waste, industrial waste, etc., and manufactures a steam with the heat of the combustion gas, for example, uses this steam for a power generating plant etc., and more specifically relates to the incineration equipment of waste.
[0002]
[Description of the Prior Art] Many fluid bed incineration equipments are used for the incineration equipment which incinerates wastes, such as a municipal solid waste, conventionally, it heats, while fluidizing a bed material by blowing air or incineration exhaust gas into bed materials, such as sand held on the distributor in a fluid bed incinerator (for example, perforated plate), from a distributor lower part, and in the fluid bed formed by making it such, wastes, such as a municipal solid waste, are thrown in and this equipment burns them. The combustion gas which occurred by this combustion results in a boiler through a combustion gas outlet line, and generates a steam by heat contact in warm water within this boiler, and this steam is used for it as turbine driving sources, such as a power generating plant.
[0003] Now, into wastes, such as this municipal solid waste, chlorinated organic compounds, such as tic [salt B Plus], are mixing, and it contains about 0.2 to 0.5% as C1 in the inflammable part. And the chlorine contained in tic [which was mixed into wastes, such as a municipal solid waste, / salt B Plus] serves as HC1 (HC1 in a municipal-solid-waste combustion gas is usually about 500-1000 ppm), acts on the tube of the boiler for steamy generating installed in the slipstream of an incinerator, and makes this corrode by combustion. Especially a tube skin temperature becomes remarkable [a high temperature corrosion] with the increase in temperature above about 350 degrees C. For this reason, about 300 degrees C of the temperature of the steam which needs to make a tube skin temperature 350 degrees C or less, and is manufactured were a limitation conventionally. Consequently, the generating efficiency by the conventional contaminant incineration is about 15% or less, and used as fuel a fuel oil, LNG, etc. which hardly contain chlorine, compared with about 30 - 40% of generating efficiencies of the plant as for which boiler-tube temperature is made to 500-600 degrees C, it was remarkably low, and the improvement was desired strongly.
[0004] In order to solve this technical problem, heating of boiler water is made into at least two or more steps of two or more step stories in previous Japanese Patent Application No. 8-69067. It carries out directly or indirectly using the heat-of-combustion energy of the cracked gas obtained at the pyrolysis process to which supply waste in the space which includes stage heating of at least 1 for the bed material more than predetermined temperature, and a pyrolysis reaction is made to carry out. On the other hand, other stage heating The superheated-steam manufacture method performed using the heat energy obtained according to the char combustion process of burning the aforementioned undecomposed residue is proposed making the char mixture which consists of the undecomposed residue and bed material which were taken out from the aforementioned pyrolysis means flow by air or the combustion gas.
[0005] That is, an operation of two or more aforementioned step story heating pyrolyzes wastes, such as a municipal solid waste, as shown in drawing 2 (in beyond ******). supply waste in space with a temperature of 300 degrees C or more, and make it perform a pyrolysis reaction -- a pyrolysis means to separate the char mixture which consists of the cracked gas which occurred by the reaction, a undecomposed residue, and a bed material, and incombustibles of each other constitutes Even if it is chlorinated cracked gas which is carried out and HCl etc. contains in the cracked gas, heating of boiler water by the heat energy of this chlorinated cracked gas Since a tube skin temperature does not become about 350 degrees C or more even if chlorinated cracked gas acts on the tube of the boiler for steamy generating, since it is considering as the abbreviation boiling point temperature before and behind 320 degrees C [200 degrees C -] of abbreviation, this is made corroded. In this case, aforementioned boiler water sets up the boiling point by pressurization before and after 320 degrees C [200 degrees C -] of abbreviation. Since it is used for absorption (in other words it is used only for the phase conversion with a steam from water, and does not act as a part for a temperature rise) of **** of this boiler water even if variation has arisen in grant of the heat energy to boiler water of the aforementioned chlorinated cracked gas for a certain reason Stable boiler water or the stable steam of heating temperature can be obtained without the skin temperature of the heat-exchange tube of boiler water rising more than chlorine **** temperature.
[0006] And since the dechlorination of the undecomposed residue which was not decomposed by the pyrolysis of 300 degrees C - 500 degrees C of the aforementioned abbreviation has already been carried out Heat energy for example, around 500-950 degrees C which this is burned and is obtained (in beyond ******, the char mixture which consists of the undecomposed residue and bed material which were taken out from the aforementioned pyrolysis means) the heat energy around 500-950 degrees C has been obtained by char combustion means to burn the aforementioned undecomposed residue, making it flow with air Even if it carries out secondary - Miyoshi heating of boiler water or the steam which mainly used and was primarily heated before and after 320 degrees C [200 degrees C -] of the aforementioned abbreviation and obtains 400-500-degree C heating steam (it is boiler-tube temperature about 450-550 degrees C), low-grade material does not have a possibility that tube **** may arise, either. When this performs power generation by contaminant incineration, 30 - 40% of the same generating efficiency as the plant which used as fuel the fuel oil which hardly contains chlorine, LNG, etc. can be obtained by the low cost.
[0007]

[Problem(s) to be Solved by the Invention] Although reduction of chlorine can obtain the superheated steam of high temperature by combining efficiently a pyrolysis furnace, a char combustion furnace and a boiler, and a superheater according to this point ****** To the life waste containing the kitchen garbage thrown in in a pyrolysis furnace In order for the thing containing many moisture to exist, for the cracked gas obtained at the aforementioned pyrolysis furnace to be diluted by the evaporation moisture from the aforementioned water contaminant, and for a calorie fall to arise and to make temperature of an ashes melting furnace into 1300 degrees C or more It will be necessary to use 30 - 50% of oxygen-enrichment air, and an oxygen Tomika facility and its operation power cost will increase sharply as a source of a cracked gas combustion air. this invention aims at canceling the fault of this point ******.
[0008]
[Means for Solving the Problem] Invention according to claim 1 is invention about the equipment for obtaining the heat energy for manufacturing the aforementioned heating steam. The cracked gas which supplied waste with the bed material in space with a temperature of 300 degrees C or more, was made to perform a pyrolysis reaction, and occurred by the reaction, A pyrolysis means to separate the char mixture which consists of a undecomposed residue and a bed material, and incombustibles of each other, Although it is the same as that of the aforementioned point ****** to include a char combustion means to burn the aforementioned undecomposed residue, making the char mixture which consists of the undecomposed residue and bed material which were drawn from the aforementioned pyrolysis means flow with air While forming with the fluid bed equipped with two or more flow regions classified by the bridge wall in the aforementioned pyrolysis means, and the waste supplied to this fluid bed circulates through the aforementioned flow region, it is characterized by forming by the flow tub which performs a pyrolysis. While the pyrolysis and continuation injection processing which become enough are attained without according to this invention a processing object carrying out a short pass to an outlet when waste circulates through two or more flow regions one by one, reduction of fluidization gas is attained and the calorie fall of cracked gas can be suppressed.
[0009] now -- in order to attain an operation of aforementioned drawing 2 -- the heat calorie ratio of cracked gas and char mixture -- "-- about 7(cracked gas): -- it is desirable to perform a pyrolysis so that it may become about 3 (char mixture)" Since this pressurized boiler water which should be warmed before and behind 100 Kgf/cm2 and has set up the boiling point before and after 309 degrees C "Boiling-point [of 309 degrees C] + latent heat of vaporization" Boiler water from ordinary temperature by the water-cooled-furnace-wall boiler 36 shown in after-mentioned drawing 1 by cracked gas, and the 1st boiler 27 (both are called 1st steamy manufacturing process (means)) The calorie started until in other words it steam-izes almost at 309 degrees C, The ratio of a calorie which starts this starting ****** from the boiling point of 309 degrees C to 500 degrees C is because it is about 7:3. Therefore, according to the aforementioned invention, a pyrolysis can fully be performed and, thereby, the heat energy of cracked gas can enlarge it enough.
[0010] In addition, if wastes, such as a municipal solid waste containing the kitchen garbage, are thrown into a direct pyrolysis furnace as described above, cracked gas will be diluted with moisture and will cause a calorie fall. Then, a means to dry waste under oxygen deficiency preferably at the temperature of 100-300 degrees C in invention according to claim 2, Supply the waste dried by the aforementioned dryness means and make it perform a pyrolysis reaction with a bed material in space with a temperature of 300 degrees C or more. A pyrolysis means to separate the char mixture which consists of the cracked gas which occurred by the reaction, a undecomposed residue, and a bed material, and incombustibles of each other, The char mixture which consists of the undecomposed residue and bed material which were taken out from the aforementioned pyrolysis means While forming including a char combustion means to burn the aforementioned undecomposed residue, with the fluid bed equipped with two or more flow regions classified by the bridge wall in the aforementioned dryness means, making it flow with air It is characterized by forming by the flow tub which dries while the waste supplied to this fluid bed circulates through the aforementioned flow region.
[0011] In addition, if drying temperature of the aforementioned municipal solid waste is performed above 300 degrees C, hydrocarbon gas will occur and it cannot perform evaporation sufficient below 100 degrees C preferably. Moreover, under oxygen deficiency, low-temperature combustion does not arise but dryness atmosphere is desirable. Therefore, a policy which performs only temperature management with the composition as a pyrolysis means also with the same aforementioned dryness means is good. That is, it is good that they are the fluid bed with which a dryness means also dries waste using the elevated-temperature sand obtained from the pyrolysis means and the same char combustion means, for example, kiln, or a horizontal-type stirring tub, and, thereby, a deployment of heat energy can be aimed at. And it is good to fully dry the waste thrown into the aforementioned pyrolysis process using the elevated-temperature sand obtained from the char combustion process. Thereby, since it has the size which becomes enough also in heat capacity also in temperature, the elevated-temperature sand obtained from a char combustion process with solution of the aforementioned technical problem can be dried easily. Moreover, since this invention is dry while waste circulates through two or more flow regions classified by the bridge wall in the aforementioned dryness means, it has the same effect as invention according to claim 1.
[0012]
[Embodiments of the Invention] Hereafter, with reference to a drawing, the suitable example of this invention is explained in detail in instantiation. However, the size of the component part indicated by this example, the quality of the material, a configuration, its relative arrangement, etc. are not the meaning that limits the range of this invention to it but only the mere examples of explanation, as long as there is no specific publication especially. Drawing 3 shows the pyrolysis furnace and drying furnace using the incineration heat of the waste concerning the example of this invention of drawing 1 which carry out superheated-steam manufacturing installation ****** and which consist of the fluid bed, respectively. On the distributors 3-1, such as a perforated plate, all make bed materials, such as flow sand, deposit, and form the fluid bed. A downflow and a upflow divide the inside of this fluid bed into flow region [of two right and left] **, and ** by the central dashboard 3-3 possible [a time style], and, as for the aforementioned diaphragm 3-3, opening of the fluid bed upper part and the pars basilaris ossis occipitalis is carried out, respectively. Moreover, the distributor 3-1 inclines downward towards the incombustibles outlet 9 side. The branching lines 6A/6B connected to the combustion-gas supply line 25 / 6-1 / 6-2, respectively are connected to the pars basilaris ossis occipitalis of the distributor 3-1 lower-part space divided by the aforementioned diaphragm 3-3, respectively. And a non-illustrated flow control valve is prepared in these branching lines 6A/6B, respectively, and it is constituted possible [control of the airstream supplied to each flow region ** carried out 2 ****s by the diaphragm 3-3 and **].
[0013] That is, by making the air flow rate of branching line 6A fewer than branching line 6B, left-hand side flow ****

becomes downward flow region **, and the flow region located in right-hand side can be made into elevation flow region ** again. Specifically, it is preferably good [the superficial gas velocity of downward flow region ** / the superficial gas velocity of 0.0 - 0.2 m/sec and elevation flow region **] preferably to set it as 0.4 - 0.6 m/sec 0.3 to 1.0 m/sec 0.0 to 0.3 m/sec. Moreover, as for the degree of tilt angle of a distributor 3-1, it is good to set up 5-45 degrees around ten -45 degrees preferably. The same of the composition of the starting superficial gas velocity, the degree of tilt angle of a distributor 3-1, etc. is said of the pyrolysis furnace of drawing 2 .

[0014] and the flow tub by the side of this drying-furnace 1B — setting -- the fluid bed upper part by the side of downward flow region ** — the waste supply line 4 -- preparing — this line 4 — wastes, such as a municipal solid waste, -- moreover, the outlet edge of the branching line 52 where ** ON of the flow sand of the char combustion furnace 10 is carried out to the bottom through a cyclone 18 is connected, and the hot flow sand around 650 degrees C consists of outlet edges of this line 52 respectively possible [an injection]

[0015] and the inclination outlet line 9-2 which dryness waste resembled the fluid bed upper surface by the side of the aforementioned elevation flow region ** towards the pyrolysis furnace 1A side possible [an injection] with gravity in the fluid bed by the side of downward flow region ** of pyrolysis furnace 1A, and inclined downward is formed Under the present circumstances, in order to serve both as an antisuckback and a gas seal, as for the outlet edge by the side of pyrolysis furnace 1A of the inclination outlet line 9-2, it is good to prepare outlet opening 9-2a into the fluid bed. In addition, also as for a bed material, it is good that the many form the transfer line 9-1 through the pusher or the screw conveyor 9-3 on the distributor 3-1 at the base of the fluid bed by the side of the aforementioned elevation flow region ** in order to transport incombustibles, such as a metal in this bed material, although supplied to pyrolysis furnace 1A from the inclination outlet line 9.

[0016] The combustion gas which was supplied through the branching lines 6A/6B, respectively from the combustion-gas entrance line 6-2 according to this drying-furnace 1B (for dryness under oxygen deficiency, fundamentally this drying furnace) the combustion gas which consumed oxygen mostly comes out of the gas supplied While wastes, such as a municipal solid waste from a line 4, and the hot flow sand around 650 degrees C from a line 52 repeat circulation by downward flow region ** and elevation flow region ** within the fluid bed, the temperature of 100-300 degrees C, Generate 100-250-degree C circulation floor space preferably, and dry waste. The moisture gas which occurred by the evaporation as shown in drawing 1 is introduced into cracked gas combustion furnace 30B by which the boiler 36 was contained through the flow control valve 57 from the outlet line 72. The waste dried on the other hand is thrown into pyrolysis furnace 1A by gravity from the inclination outlet line 9-2 which inclined downward with flow sand. Moreover, after a part of bed material removes large-sized incombustibles from the incombustibles eccrisis line 8 with a filter 80, ** ON of it is carried out to drying-furnace 1B or the char combustion furnace 10 through the ** ON line 5 which consists the bed material of the remainder of a bucket conveyor etc., and it performs circulation control of a bed material.

[0017] Like the aforementioned drying-furnace 1B, pyrolysis furnace 1A into which the aforementioned dryness waste and flow sand are introduced on the other hand carries out opening of the **** necessary branching line 51 of the char combustion furnace 10 through a cyclone 18 into the fluid bed by the side of downward flow region **, and constitutes it from this line 51 possible [an injection of the hot flow sand around 650 degrees C]. And the inclination outlet line 9 toward which char mixture inclined downward towards the char combustion furnace 10 side possible [an injection] with gravity in the fluid bed of the char combustion furnace 10 is formed in the fluid bed upper surface by the side of the aforementioned elevation flow region **.

[0018] Under the present circumstances, the incombustibles which collected on the distributor 3-1 of pyrolysis furnace 1A form the incombustibles eccrisis line 8 on the distributor 3-1 at the base of the fluid bed by the side of the aforementioned elevation flow region **, and after removing large-sized incombustibles in the filter 80 arranged in the middle of this line 8 path, the char mixture of the remainder is constituted so that ** ON may be carried out to drying-furnace 1B or the char combustion furnace 10 through the ** ON line 5 which consists of a bucket conveyor etc. In addition, since it is already cooled by 150 degrees C or less of heat contact of filter 80 grade, it is not necessary to necessarily constitute the char mixture after removing large-sized incombustibles from an air current conveyance means which carries out a postscript, and it is good at the usual bucket conveyor.

[0019] Drawing 4 is the pyrolysis furnace (a drying furnace also omits explanation of the structure by the side of a drying furnace for the same composition.) of four-room structure. The outlet edge of the branching line 52 where ** ON of the elevated-temperature flow sand of the char combustion furnace 10 is carried out to the waste supply line 4 is connected to the entrance-side wall of downward flow region ** of left end pyrolysis furnace 1A. The incombustibles eccrisis line 8 (8A, 8B) is formed, respectively on the inclination outlet line 9 which inclined downward towards the char combustion furnace 10 side in the right end elevation flow region ** outlet wall, and the distributor 3-1 at the aforementioned base of the elevation fluid bed. A distributor 3-1 is turned to the flow region side of ** from the flow region side of ** which formed the aforementioned lines 8 and 9. downward and first distributor 3-1A Moreover, second distributor 3-1B is allotted downward towards the flow region side of **, respectively from the flow region side of **, and diaphragm 3-3A and 3-3B height are further set to the flow region side of the flow region side of ** to ** respectively possible [overflow] from the flow region side of ** again at the flow region side of **.

[0020] Furthermore, by making the air flow rate of branching line 6A of ** and ** fewer than branching line 6B of ** and **, as described above, flow **** of ** and ** serves as a downward flow region again, and let the flow region of ** and ** be an elevation flow region. Moreover, the incombustibles eccrisis lines 8B and 8A are formed in the side attachment wall on the first and second distributor 3-distributors 3-1 by the side of the elevation flow region of ** in the facing-down side termination position of 1A and 3-1B, and **, respectively. In addition, in the case of a drying furnace, the transfer line 9-1 through the pusher or the screw conveyor 9-3 is formed instead of the aforementioned incombustibles eccrisis lines 8B and 8A. Moreover, the inclination outlet line 9 toward which char mixture inclined downward towards the char combustion furnace 10 side possible [an injection] with gravity in the fluid bed of the char combustion furnace 10 is formed in the fluid bed upper surface by the side of the elevation flow region of **.

[0021] According to this pyrolysis furnace 1A, by the combustion gas supplied through the branching lines 6A/6B, respectively ** And flow **** of ** serves as a downward flow region, and the flow region of ** and ** turns into an elevation flow region. ** the area within a downward flow -- a line 9 — char object mixture -- moreover, 650-degree C hot flow sand with injection ****, respectively from the line 51 in which the sand of the char combustion furnace 10 carries out ****** ON.** The flow region space which repeats and circulates through a 350-500-degree C downflow and a upflow in order of ->**->**->**->** is formed. The cracked gas which was made to perform the pyrolysis

reaction of dryness waste in this flow region space, and occurred by the reaction from the cracked gas outlet line 71 to the ashes melting furnace 31 Moreover, the char mixture which consists of a undecomposed residue and flow sand can be separated from the char mixture ejection line 9, incombustibles of each other can be separated into the char combustion furnace 10 from the incombustibles ejection line 8 again, respectively, and it can take out.

[0022] Drawing 5 is the modification which made integral construction the pyrolysis furnace shown in drawing 3 , and the drying furnace, and it turns to the method of the right [left / drawing top]. one by one Downward flow region ** elevation flow region ** of the downward flow region of a drying furnace, an elevation flow region, and a pyrolysis furnace is arranged. The outlet edge of the branching line 52 where ** ON of the elevated-temperature flow sand of the char combustion furnace 10 is carried out to the waste supply line 4 is connected to the entrance-side wall of downward flow region ** of a left end drying furnace. The incombustibles eccrisis line 8 is formed, respectively on the inclination outlet line 9 which inclined downward towards the char combustion furnace 10 side in elevation flow region [of a right end pyrolysis furnace] **, and ** outlet wall, and the distributor 3-1 at the aforementioned base of the elevation fluid bed. And make a distributor 3-1 incline towards the bottom towards the downward flow region ** side of pyrolysis furnace 1A from the elevation flow region ** side of drying-furnace 1B, and it is arranged by series. Furthermore, while the dashboard 33 arranged between the elevation flow region ** side of drying-furnace 1B and downward flow region ** of pyrolysis furnace 1A opening 33a Carries out the distributor 3-1 upper part By carrying out opening of this dashboard 33 upper limit to the downward flow region ** side of pyrolysis furnace 1A, forming the rectangle-like (shape of inverted-L character) outlet line 92 in the opening 33a, and carrying out opening of the pars basilaris ossis occipitalis into downward flow region ** of pyrolysis furnace 1A the waste after dryness — flow sand — **** — it is supplied by gravity in downward flow region ** of pyrolysis furnace 1A from the outlet line 92 In addition, as for flow sand, it is better than the aforementioned outlet line 92 to carry out opening of the **** necessary branching line 51 of the char combustion furnace 10 on downward flow region ** of pyrolysis furnace 1A, and to constitute from this line 51 possible [an injection of the hot flow sand around 650 degrees C] by the heat exchange in drying-furnace 1B, since the temperature fall has already been carried out.

[0023] Drawing 1 and drawing 6 , and 7 show the superheated-steam manufacturing installation using the incineration heat of the waste concerning the example of this invention, and drawing 1 is the general drawing, drawing 6 , and the front view and the plan showing the important section composition 7 indicates a drying furnace, a pyrolysis furnace, and a char combustion furnace to be. Since the drying furnace and pyrolysis furnace of a **** view are the same as that of drawing 3 , the explanation is omitted. The char combustion furnace 10 which consists of a fluidized bed furnace forms subfluid bed 10B in the inclination lower part flank of the distributor 11 of main fluid bed 10A which consists of char mixture introduced from the aforementioned introductory line 9 through bridge-wall 10C while connecting the char mixture introduction line 9 and the bed-material ejection line 160, respectively into the fluid bed by the side of the distributor 11 crowning which it was made to incline downward at the pars basilaris ossis occipitalis towards an incombustibles outlet section side, and was allotted to it, as shown in drawing 6 and 7. And air is supplied to main fluid bed 10A and subfluid bed 10B from the air supply line 12 of the distributor 11 aforementioned lower part, respectively. Heat at 600-750 degrees C within main fluid bed 10A first, and a undecomposed residue is burned. Furthermore, it constitutes so that combustion and flow sand of a undecomposed residue may circulate between subfluid bed 10B which adjoins through main fluid bed 10A and bridge-wall 10C. And it has connected through the 2nd superheater 29-1 and line 40 which arranged the 3rd superheater 29-2 in the bed material of the aforementioned subfluid bed (subchar combustion section) 10B, and were arranged in the upper part region of the char combustion furnace 10. In addition, you may constitute so that it may circulate through main fluid bed 10A as well as aforementioned drawing 2 by downward flow region ** and elevation flow region **.

[0024] In addition, a boiler 36-2 is arranged in a char combustion furnace 10 upper-part duct region again in the duty which drops on about 850 degrees C the combustion gas which became high 950-1300-degree-C order at uselessness with overheating of the superheated steam introduced through the line 28-1 from the 1st superheater 28, and the 2nd superheater 29-1 arranged in the char combustion furnace 10 upper part carries out the duty which drops the combustion gas which became high unnecessarily. In addition, any trouble cannot be found, when maintaining the steam temperature in the 1st superheater 28 at 400-520 degrees C, even if it drops the temperature of combustion on about 850 degrees C as mentioned above.

[0025] And the small incombustibles which do not burn with the aforementioned char combustion furnace 10 are taken out from the incombustibles ejection line 14. And the 2nd filter 140 around 2mm is infixed in the aforementioned incombustibles ejection line 14 for a mesh. Small incombustibles, and flow sand and ash content are separated about the excretions discharged from the aforementioned line 14, and as fluid bed downward flow region [of drying-furnace 1B] ** or the char combustion furnace 10 fed with flow sand in the lines 5, such as the aforementioned bucket conveyor, / 5-1 / 5-2, it constitutes. Now, the bed material in the aforementioned char combustion furnace 10 is led to the air current conveyance mechanism 16 from an outlet path. After the conveyance force by the airstream is given by this conveyance mechanism 16, it is introduced into mind and ********** 18, for example, a cyclone, through a line 17. It separates into a bed material and an elevated-temperature airstream here, and ** ON of the elevated-temperature bed material is carried out for an elevated-temperature airstream to the ashes melting furnace 31 through the branching valve 50 and the branching lines 51 and 52 at drying-furnace 1B and pyrolysis furnace 1A, respectively.

[0026] By the air current conveyance mechanism prepared in the bed-material outlet line 160 side in the aforementioned char combustion furnace 10 The termination of the aforementioned outlet line 160 and the level path section 162 to form successively are formed in the bottom side side attachment wall of the perpendicular path section 161 which leads to the aforementioned cyclone 18. The compressed-air style of 3 around 20-200 degrees C - 6 Kgf/cm2 is intermittently fed from level path section 162 side edge, respectively more nearly continuously airstream / ordinary-pressure / around 20-200 degrees C] than the base of the aforementioned perpendicular path section 161. And the gas-particle weight ratio of the aforementioned bed material and an airstream,: (sand/air) The air current conveyance force in which even a cyclone can convey the aforementioned bed material smoothly can be acquired by setting it as 1 / 1 - 5/1.

[0027] As for the ashes melting furnace 31, the cracked gas from a pyrolysis furnace is introduced through the elevated-temperature air and the line from a char combustion furnace through the aforementioned cyclone 18 in this ashes melting furnace 31. Furthermore, a part for nonflammable [of the dust 29 and/or the char combustion furnace 10 which were picked out from the **** bag filter 37] is introduced through an air current from a line 30. For

example, a part for the aforementioned dust 29 or nonflammable is fused as 1300 degrees C or more with the heat of combustion of the aforementioned elevated-temperature air and cracked gas, carrying out revolution separation of the ashes by the revolution style. The fused this ash content is dropped to a non-illustrated water reservoir through a melting ashes outlet line, and an about several mm water-cooled scoria is generated, or it **** with air cooling, and it constitutes so that this scoria may be used as the structural aggregate. Moreover, the steam/boiler water which heats the water-cooled-furnace-wall boiler 36 which cracked gas combustion furnace 30B was arranged in the upper part region of the aforementioned ashes melting furnace 31, and was arranged in this cracked gas combustion furnace 30B, and is started to the boiling point of about 200-309 degrees C are manufactured.
[0028] the heat exchange in which it returned to drawing 1 and, as for 20, the 1st superheater 28 and the boiler 27 were arranged -- a column -- it is -- this heat exchange -- a column -- after the combustion gas from the char combustion furnace 10 is introduced into 20 crowning through the combustion gas from the ashes melting furnace 31, and the 2nd superheater 29-1, respectively and heating by the 1st superheater 28 drops gas temperature first, heating of the 1st boiler 27 is performed Consequently, boiler water incorporated from the boiler water entrance 26 by the 1st boiler 27 is heated before and after 300 degrees C, and a steam or heating water is supplied to the 1st superheater 28 from the 1st boiler outlet line 25. Boiler water is introduced also into the boiler 36-2 of the char combustion furnace 10, and the boiler 36 of the ashes melting furnace 31 through branching line 26' and 26", and supplies a steam or heating water to the 1st superheater 28 through branching line 25' and 25".
[0029] In addition, 100.Kgf/cm2 Although aforementioned boiler water which pressurized forward and backward and has set up the boiling point before and after 309 degrees C is introduced into boilers 27 and 36 and 36-2 and the 1st phase is heated, the amount of water flow is controlled so that the heating temperature becomes before and after 309 degrees C near [aforementioned] the boiling point. consequently, each aforementioned boiler 36 and 36- the degree of tube surface wall temperature of 2 and 27 -- the above -- warming -- water is followed and it can maintain before and after 309 degrees C, and even if chlorine or HCl is included in the cracked gas by which a metaphor heat exchange is carried out, corrosion does not arise in low-grade material
[0030] The steam / heating water taken out from 'are introduced. the 1st superheater 28 -- each aforementioned boiler 36 and 36- the outlet line 25 of 2 and 27, 25', and 25' -- Superheated steam is manufactured by the combustion gas around the aforementioned 850 degrees C. from the steamy outlet line 28-1 below to the 2nd superheater 29-1 Furthermore, the superheated steam which introduced into the 3rd superheater 29-2 respectively in series or in parallel, and was overheated by 400-550 degrees C from the line 28-2 is taken out, and it feeds into a generator.
[0031] It lets the outlet line 160, the air current conveyance mechanism 16, a line 17, a cyclone 18, and the branching lines 51/52 pass from said char combustion furnace 10 at drying-furnace 1B to explain an operation of the aforementioned example briefly. by air current conveyance Next, 600-700 degrees C, 650-degree C circulation sand is specifically supplied, and, on the other hand, water wastes, such as a municipal solid waste, are supplied from the waste supply line 4. Furthermore, making it circulate by the downflow and the upflow within the fluid bed which the slight air for temperature controls was supplied [fluid bed] to the combustion gas from lower air or the lower combustion-gas entrance line 6-2, and made flow sand flow After drying by maintaining the temperature in drying-furnace 1B at 100-300 degrees C, the dryness waste mixture which consists of the waste and flow sand after dryness is introduced into pyrolysis furnace 1A from a line 9-2. Moreover, the moisture gas which occurred by dryness within the aforementioned drying-furnace 1B is introduced into cracked gas combustion furnace 30B of the ashes melting-furnace 31 upper part by which the boiler 36 was contained from the outlet line 72, and controls the temperature of combustion in cracked gas combustion furnace 30B before and after 850 degrees C.
[0032] Now, into wastes, such as the aforementioned municipal solid waste, chlorinated organic compounds, such as tic [salt B Plus], are mixing, and it contains about 0.2 to 0.5% as C1 in the inflammable part. And 600-700-degree C circulation sand is supplied to pyrolysis furnace 1A, respectively from the dryness waste mixture from a line 9-2, and the aforementioned branching line 51. By processing at the temperature of 350-500 degrees C, making it circulate by the downflow and the upflow within the fluid bed which the slight air for temperature controls was supplied [fluid bed] to the combustion gas from lower air or the lower combustion-gas entrance line 6-2, and made flow sand flow The undecomposed residue which does not contain chlorine substantially is obtained from the char mixture ejection line 9 which made it incline downward.
[0033] That is, the chlorine contained in waste will be substantially contained in cracked gas altogether, and will be discharged by the cracked gas outlet line 71. In addition, the large-sized incombustibles separated at the pyrolysis reaction in pyrolysis furnace 1A are discharged out of equipment through a filter 80 from the incombustibles ejection line 8. Moreover, the cracked gas obtained by the aforementioned pyrolysis furnace 1A is supplied to the ashes melting furnace 31 through a line 71.
[0034] Thereby, since the cracked gas of a line 71 is not diluted with moisture gas, it turns into high calorie gas, with the ashes melting furnace 31, burns with the 500-600-degree C elevated-temperature air separated from the flow sand of a char combustion furnace through the cyclone 18, and can make temperature of the ashes melting furnace 31 easily 1300-1500 degrees C.
[0035] The char mixture which consists of the flow sand and the undecomposed residue which were taken out from the char mixture ejection line 9 by pyrolysis furnace 1A on the other hand, and does not contain chlorine substantially Burn a undecomposed residue, raising 600-750 degrees C and making flow sand flow by making it burn with the air which is supplied to the lower part of a combustion furnace 10, and is supplied through the branching line 12-1, 12-2, and a distributor 11 from the air supply line 12. Furthermore, the temperature of a combustion furnace 10 rises by combustion exothermic reaction by supplying air further from the air supply line 63 for perfect combustion. Although this temperature value is decided by the amount and temperature of the calorific value of the undecomposed residue supplied from the char mixture ejection line 9, the air of the air supply lines 12 and 63, and the flow sand of the sand circulation line 19, it may become an elevated temperature around 1000-1300 degrees C. then, the line 15 after carrying out the heat exchange of the combustion gas which does not contain chlorine substantially after arranging a boiler 36-2 and controlling by the char combustion furnace 10 before and after 850 degrees C by the heat exchange with this boiler 36-2 to the 2nd superheater 29-1 through a line 40 -- minding -- a heat exchange -- it is introduced into a column 20
[0036] On the other hand, this example is making subchar combustion section 10B which formed the 3rd superheater 29-2 attach to the aforementioned char combustion furnace 10, as shown in drawing 1 and drawing 6 . **** by the

3rd superheater 29-2 drops the bed material in the char combustion furnace 10 on 600-750 degrees C. ** ON of the 500-650-degree C flow sand can be carried out for the bed material dropped on 600-750 degrees C to pyrolysis furnace 1A and drying-furnace 1B through a line 160, the air current conveyance mechanism 16, a cyclone 18, and the branching lines 51/52. this -- As a result, 350 degrees C to 500 degrees C and drying-furnace 1B temperature are stabilized around 100-250 degrees C, and the pyrolysis temperature in the aforementioned pyrolysis furnace 1A can be controlled. In addition, the interior of the 3rd superheater 29-2 is carried out to aforementioned subchar combustion section 10B, and this is useful to stabilization of char combustion temperature.

[0037] In the aforementioned ashes melting furnace 31, as described above, the ashes separated from the **** bag filter etc. with the aforementioned cracked gas / elevated-temperature air are introduced, ash content is fused by the combustion energy of the aforementioned cracked gas, the water reservoir whose this fused ash content is not illustrated is dropped, and an about several mm water-cooled scoria is generated, or it **** with air cooling, and this scoria is used as the structural aggregate. Moreover, cracked gas combustion furnace 30B is arranged in the aforementioned ashes melting-furnace 31 upper-part region, from a line 62, sufficient air for the aforementioned unburnt glow cracked gas is supplied, and the further perfect combustion of this cracked gas and the moisture gas from drying-furnace 1B is performed. Since the temperature in cracked gas combustion furnace 30B is maintainable before and after 850 degrees C as a result, the steam/boiler water to which the temperature rise of boiler water introduced into the boiler 36 was carried out to the boiling point of about 200-309 degrees C can be manufactured so much.

[0038] the combustion gas which the elevated-temperature exhaust gas around 850 degrees C taken out from the ashes melting furnace 31 on the other hand was diluted by the combustion gas from the char combustion furnace 10 which does not contain chlorine substantially, and was this diluted -- a heat exchange — it is introduced into a column 20, and it is used in order to heat the steam/boiler water around 200-320 degrees C manufactured by the 1st boiler 27 and the water-cooled-furnace-wall boiler 36 by the 1st superheater 28 and to consider as superheated steam Since the exhaust gas which has passed through the ashes melting furnace 31 is diluted by combustion by mixture with the combustion gas from the char combustion furnace 10 again, although a high temperature corrosion is mitigated also considering the boiler-tube skin temperature of the 1st superheater 28 as 350 degrees C or more, as for the load of the 1st superheater, it is desirable to make it small as much as possible.

[0039] next, a heat exchange -- the inside of a column 20 -- each boiler 36 and 36- the steam/boiler water which carried out the temperature rise to the boiling point of about 200-309 degrees C by 2 and 27 introduce into the 1st superheater 28 -- having -- on the other hand -- a heat exchange -- a column — the combustion gas around 850 degrees C introduced into 20 crowning can heat the 1st superheater 28, and can obtain superheated steam In addition, since about 500-1000 ppm of HC1 are contained in the gas introduced in the aforementioned cracked gas combustion furnace 30B, the flow rate of boiler water is adjusted and the tube skin temperature of a boiler 36 suppresses a high temperature corrosion as about 350 degrees C or less of the average conventionally. For this reason, although hot superheated steam is not obtained by the boiler 36, since about 200-320 degrees C can be heated, if this is further heated by the superheater 29-1 after the 1st superheater 28, and 29-2, about 400-550-degree C hot superheated steam can be obtained.

[0040] and a heat exchange -- a column -- although the atmospheric exhaust of the most is carried out after desalting the combustion gas after 20 passage with the dechlorination bag filter 38 after dust removal with the bag filter 37 for ****, a line 25 is supplied to a part by the aforementioned drying-furnace 1B and pyrolysis furnace 1A The dust removed with the bag filter 37 for ****** is supplied to an ashes melting furnace. In addition, as for the exhaust gas which flows the aforementioned line 25, the oxygen of the temperature is before and after 150 degrees C at 3 - 4%.

[0041]

[Effect of the Invention] Above, like a publication, according to invention according to claim 1, when waste circulates through two or more flow regions one by one, the pyrolysis and continuation injection processing which become enough are attained.

[0042] The cracked gas which is a high calorie and was stabilized is obtained without the variation in the calorie of cracked gas arising, since the waste thrown into the aforementioned pyrolysis means is fully dried with the dryness means according to invention according to claim 2. Moreover, since according to invention according to claim 3 it is dry while waste circulates through two or more flow regions classified by the bridge wall in the aforementioned dryness means, much more promotion of an effect of the invention according to claim 2 can be aimed at.

[Translation done.]

* NOTICES *

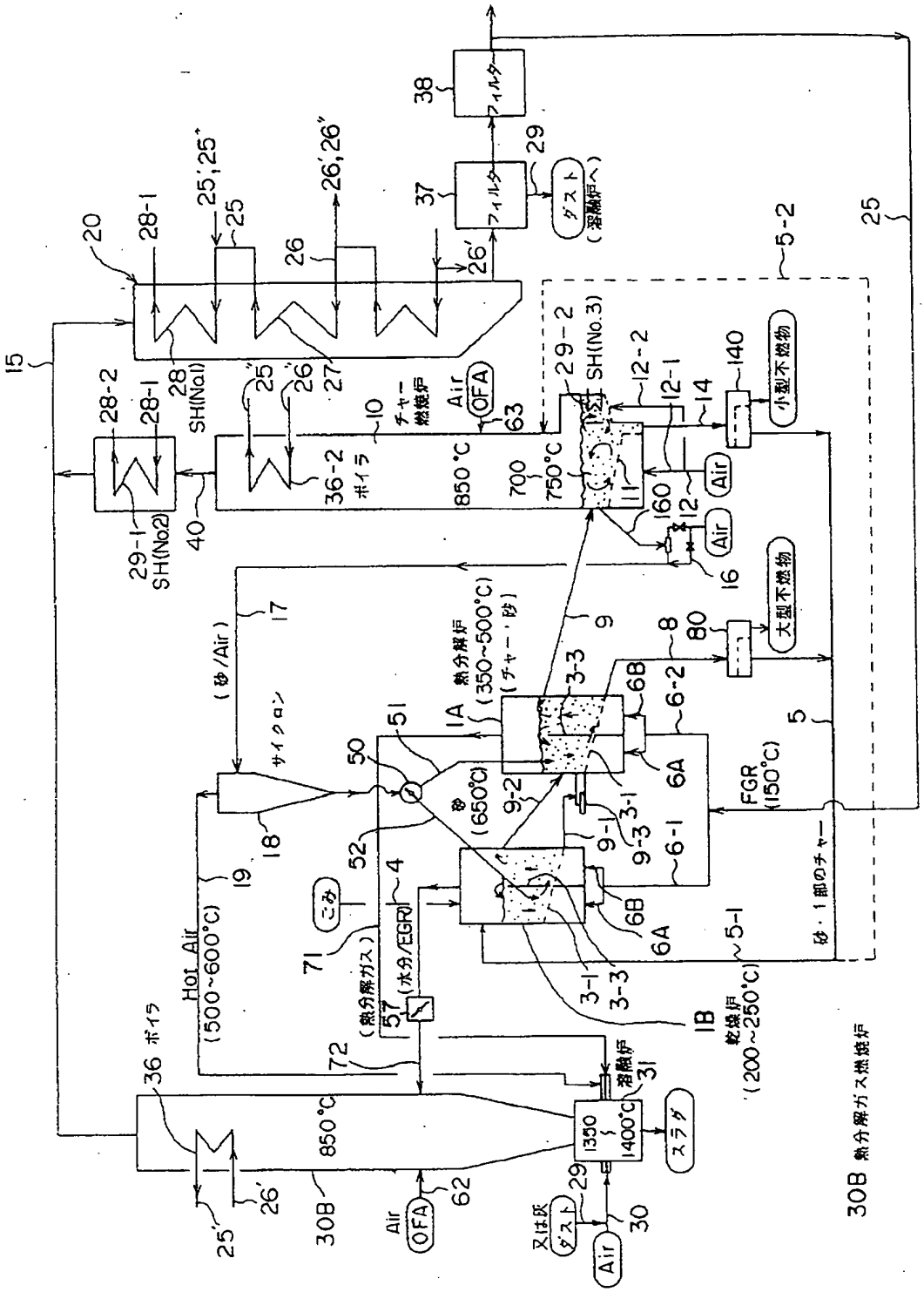
1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

DESCRIPTION OF DRAWINGS

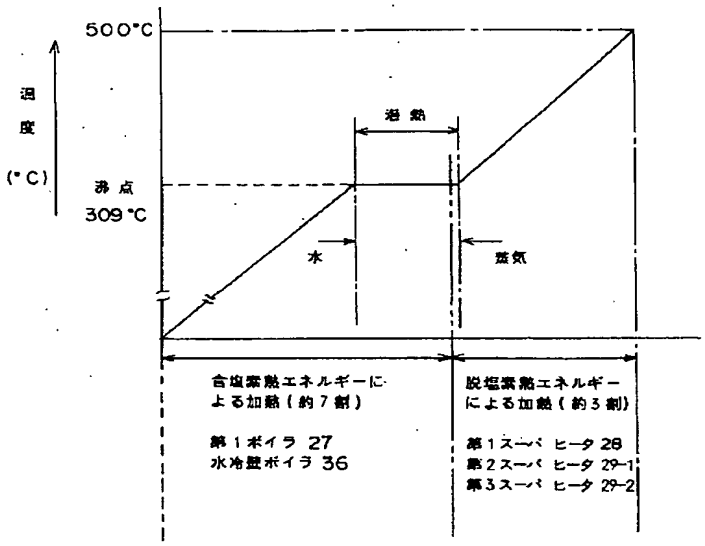
[Brief Description of the Drawings]
[Drawing 1] It is the schematic diagram showing the superheated-steam manufacturing installation using the incineration heat of the waste concerning the example of this invention.
[Drawing 2] It is the graphical representation showing the manufacture procedure of superheated steam in which the incineration heat of the waste concerning the basic composition of this invention was used.
[Drawing 3] The drying furnace and pyrolysis furnace of drawing 1 are shown, (A) is a plan and (B) is front view.
[Drawing 4] The pyrolysis furnace which the flow region quadrisected in the shape of [of a "rice field"] a character is shown, (A) is a plan and (B) - (D) is an A-A line, a B-B line, and a C-C line cross section, respectively.
[Drawing 5] The drying furnace and pyrolysis furnace which show the modification of drawing 3 which unified the drying furnace and the pyrolysis furnace are shown, (A) is a plan and (B) is front view.
[Drawing 6] It is the front view showing the important section composition which shows the drying furnace, pyrolysis furnace, and char combustion furnace of drawing 1 .
[Drawing 7] It is the plan showing the important section composition which shows the drying furnace, pyrolysis furnace, and char combustion furnace of drawing 1 .
[Description of Notations]
1A Pyrolysis furnace
1B Drying furnace
10 Char Combustion Furnace
10A The main char combustion section
10B Subchar combustion section
16 Air Current Conveyance Mechanism
18 Cyclone
20 Heat Exchange — Column
27, 36, 36-2 Boiler (1st steamy manufacture means)
28, 29-1, 29-2 Superheater (2nd steamy manufacture means)
31 Ashes Melting Furnace
37 38 Bag filter

[Translation done.]

Drawing selection drawing 1

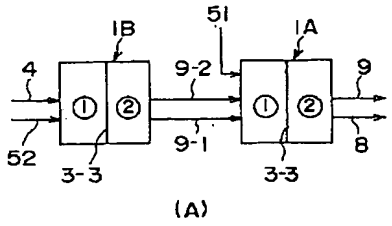


Drawing selection drawing 2

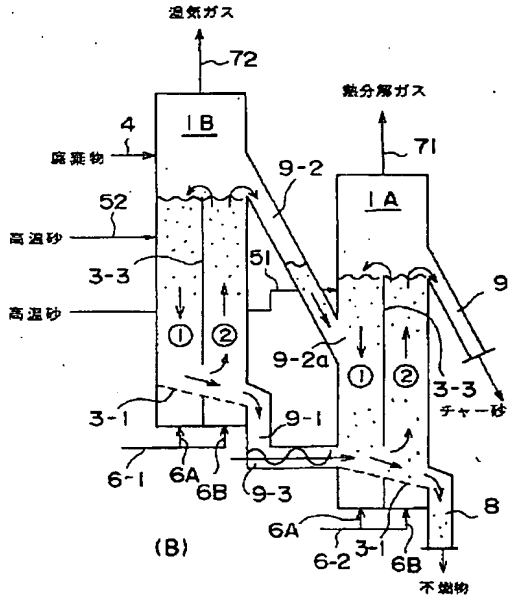


[Translation done.]

Drawing selection drawing 3



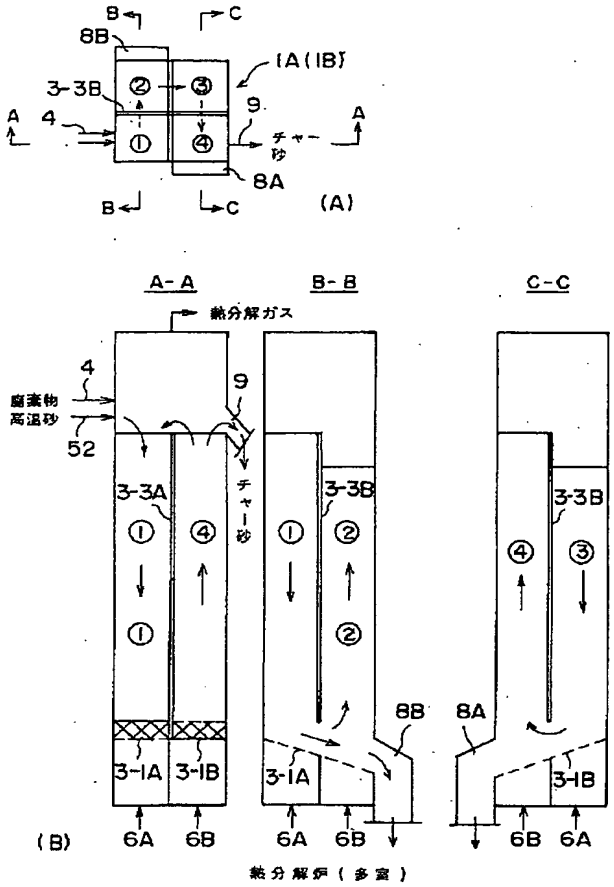
(A)



(B)

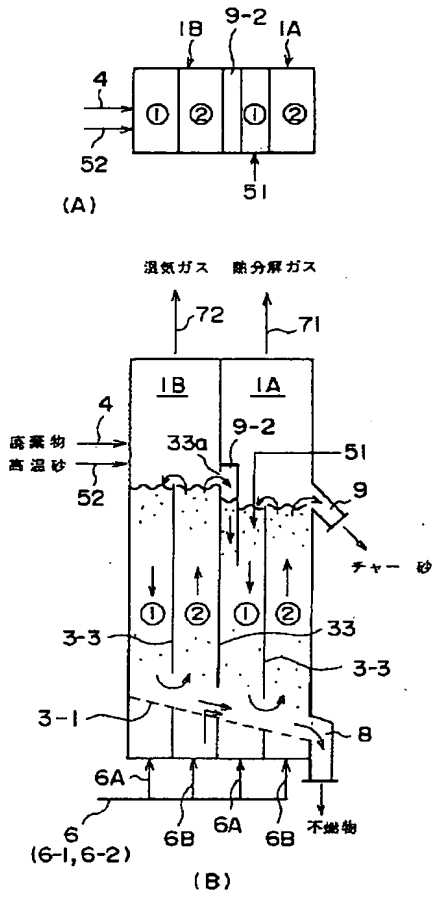
[Translation done.]

Drawing selection drawing 4



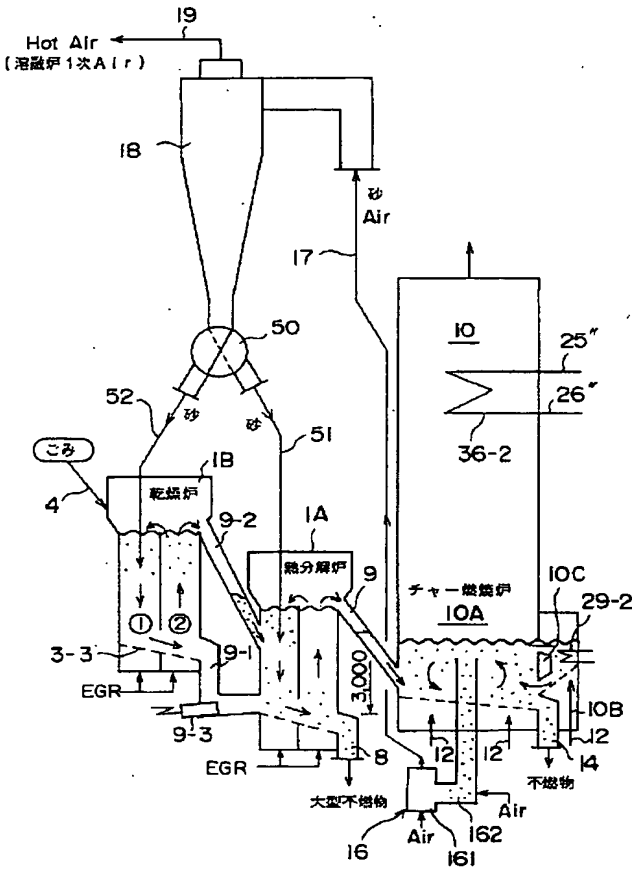
[Translation done.]

Drawing selection | drawing 5



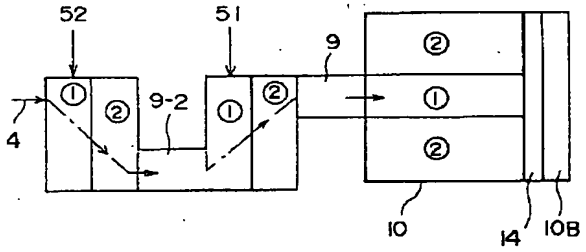
[Translation done.]

Drawing selection drawing 6



[Translation done.]

Drawing selection drawing 7



[Translation done.]

(19)日本国特許庁（ＪＰ）　(12) **公開特許公報（Ａ）**　(11)特許出願公開番号

特開平10－89640

(43)公開日　平成10年(1998)４月10日

(51)Int.Cl.[6]		識別記号	FI		
Ｆ２３Ｇ	5/027	ＺＡＢ	Ｆ２３Ｇ	5/027	ＺＡＢＢ
	5/02	ＺＡＢ		5/02	ＺＡＢＡ
	5/04	ＺＡＢ		5/04	ＺＡＢＺ
	5/16	ＺＡＢ		5/16	ＺＡＢＥ
	5/30	ＺＡＢ		5/30	ＺＡＢＺ

審査請求　未請求　請求項の数３　ＦＤ　（全 12 頁）

(21)出願番号　特願平8－266810

(22)出願日　平成８年(1996)９月17日

(71)出願人　000006208
三菱重工業株式会社
東京都千代田区丸の内二丁目５番１号

(72)発明者　堀添　浩俊
横浜市金沢区幸浦一丁目８番地１　三菱重工業株式会社横浜研究所内

(72)発明者　佐藤　淳
横浜市金沢区幸浦一丁目８番地１　三菱重工業株式会社横浜研究所内

(72)発明者　清水　義仁
横浜市金沢区幸浦一丁目８番地１　三菱重工業株式会社横浜研究所内

(74)代理人　弁理士　高橋　昌久　（外１名）

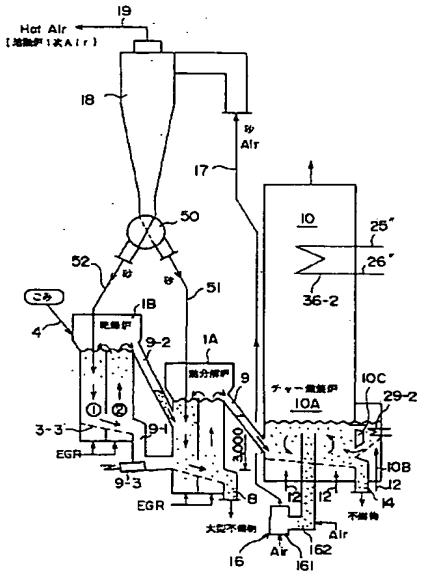
最終頁に続く

(54)【発明の名称】　廃棄物の焼却装置と該廃棄物の焼却熱を利用した過熱蒸気製造装置

(57)【要約】

【課題】　熱分解工程に投入される廃棄物やチャー燃焼工程より得られた高温砂が高熱雰囲気下でも円滑な乾燥と熱分解が可能となる廃棄物の焼却装置の提供。

【解決手段】　１００～３００℃の温度で好ましくは酸素不足下で廃棄物を乾燥する手段と、温度３００℃以上の空間内に流動媒体とともに前記乾燥手段により乾燥された廃棄物を供給して熱分解反応を行なわせ、その反応により発生した熱分解ガスと未分解残渣および流動媒体から成るチャー混合物と不燃物とを互いに分離する熱分解手段とを含み、前記乾燥手段若しくは熱分解手段を、仕切壁により区分けされた複数の流動域を具えた流動床で形成するとともに、該流動床に供給された廃棄物が前記流動域を循環しながら乾燥を行う流動槽で形成したことを特徴とする。



1

【特許請求の範囲】

【請求項１】　温度３００℃以上の空間内に、流動媒体とともに廃棄物を供給して熱分解反応を行なわせ、その反応により発生した熱分解ガスと、未分解残渣および流動媒体から成るチャー混合物と、不燃物とを互いに分離する熱分解手段と、

前記熱分解手段より導かれた未分解残渣および流動媒体から成るチャー混合物を、空気によって流動させながら前記未分解残渣を燃焼させるチャー燃焼手段とを含み、

前記熱分解手段を、仕切壁により区分けされた複数の流動域を具えた流動床で形成するとともに、該流動床に供給された廃棄物が前記流動域を循環しながら熱分解を行う流動槽で形成したことを特徴とする廃棄物の焼却装置。

【請求項２】　１００～３００℃の温度で好ましくは酸素不足下で廃棄物を乾燥する手段と、

温度３００℃以上の空間内に流動媒体とともに前記乾燥手段により乾燥された廃棄物を供給して熱分解反応を行なわせ、その反応により発生した熱分解ガスと未分解残渣および流動媒体から成るチャー混合物と不燃物とを互いに分離する熱分解手段と、

前記熱分解手段より取り出された未分解残渣および流動媒体から成るチャー混合物を、空気によって流動させながら前記未分解残渣を燃焼させるチャー燃焼手段とを含み、

前記乾燥手段を、仕切壁により区分けされた複数の流動域を具えた流動床で形成するとともに、該流動床に供給された廃棄物が前記流動域を循環しながら乾燥を行う流動槽で形成したことを特徴とする廃棄物の焼却装置。

【請求項３】　請求項１若しくは２記載の仕切壁により区分けされた複数の流動域を、分散板の下方より供給する気流制御により形成される下降流動域と上昇流動域とにより構成するとともに、前記下降流動域と上昇流動域との間を廃棄物が循環するように構成したことを特徴とする請求項１若しくは２記載の廃棄物の焼却装置。

【発明の詳細な説明】

【０００１】

【発明の属する技術分野】本発明は、都市ごみや産業廃棄物等を焼却し、その燃焼排ガスの熱により蒸気を製造して、例えば該蒸気を発電プラント等に用いる過熱蒸気製造に関する発明で、より具体的には廃棄物の焼却装置に関する。

【０００２】

【従来の技術】従来より都市ごみ等の廃棄物を焼却する焼却装置には流動床焼却装置が多く用いられ、かかる装置は流動床焼却炉内の分散板（例えば多孔板）上に収容された砂等の流動媒体に分散板下方より空気または焼却排ガス等を吹き込むことにより流動媒体を流動化するとともに加熱し、そのようにして形成された流動床内に都市ごみ等の廃棄物を投入して燃焼させる。この燃焼により発生した燃焼ガスは、燃焼ガス出口ラインを経てボイラに至り、該ボイラ内で温水との熱接触により蒸気を発生させ、該蒸気を発電プラント等のタービン駆動源として用いるものである。

2

【０００３】さてかかる都市ごみ等の廃棄物中には塩ビプラスチック等の含塩素有機化合物が混入しており、可燃分中にＣｌとして約０．２～０．５％含有されている。そして都市ごみ等の廃棄物中に混入した塩ビプラスチック等に含まれる塩素は、燃焼によってＨＣｌとなり（通常、都市ごみ燃焼排ガス中のＨＣｌは約５００～１０００ppm）、焼却炉の後流に設置された蒸気発生用ボイラのチューブに作用してこれを腐食させる。特にチューブ表面温度が約３５０℃以上では温度の増加とともに高温腐食が顕著となる。このため、従来、チューブ表面温度は３５０℃以下にする必要があり、製造される蒸気の温度は約３００℃が限界であった。その結果、従来のごみ焼却による発電効率は約１５％以下であって、塩素を殆ど含有しない重油やＬＮＧ等を燃料とし、ボイラチューブ温度を５００～６００℃にできるプラントの発電効率約３０～４０％に比べて著しく低く、その改善が強く望まれていた。

【０００４】かかる課題を解決するため、先の特願平８－６９０６７において、ボイラ水の加熱を少なくとも２段階以上の複数段階とし、少なくとも一の段階加熱を所定温度以上の流動媒体を含む空間内に廃棄物を供給して熱分解反応を行なわせる熱分解工程で得た熱分解ガスの燃焼熱エネルギを利用して直接若しくは間接的に行ない、一方他の段階加熱を、前記熱分解手段より取り出された未分解残渣および流動媒体から成るチャー混合物を空気または燃焼排ガスによって流動させながら前記未分解残渣を燃焼させるチャー燃焼工程により得られた熱エネルギを利用して行なう過熱蒸気製造方法を提案している。

【０００５】すなわち、前記複数段階加熱の作用は、例えば図２に示すように、都市ごみ等の廃棄物を熱分解（本先願発明では、温度３００℃以上の空間内に廃棄物を供給して熱分解反応を行なわせ、その反応により発生した熱分解ガスと未分解残渣および流動媒体から成るチャー混合物と不燃物とを互いに分離する熱分解手段により構成している。）してその熱分解ガス中にＨＣｌ等が含有する含塩素熱分解ガスであっても、該含塩素熱分解ガスの熱エネルギによるボイラ水の加熱は、略２００℃～３２０℃前後の略沸点温度としている為に、含塩素熱分解ガスが蒸気発生用ボイラのチューブに作用してもチューブ表面温度が約３５０℃以上とならない為に、これを腐食させる事にならない。この場合前記ボイラ水は加圧により沸点を略２００℃～３２０℃前後に設定してある為に前記含塩素熱分解ガスのボイラ水への熱エネルギの付与にバラツキが生じていてもそれは該ボイラ水の潜熱の吸収（言い換えれば水から蒸気への相変換にのみ使

用され温度上昇分として作用しない）に使用されるために、ボイラ水の熱交換チューブの表面温度が塩素腐触温度以上に上昇する事なく、安定した加熱温度のボイラ水若しくは蒸気を得る事が出来る。

【０００６】そして前記略３００℃～５００℃の熱分解により分解されなかった未分解残渣は既に脱塩素されているために、これを燃焼させて得られる、例えば５００～９５０℃前後の熱エネルギ（本先願発明では前記熱分解手段より取り出された未分解残渣および流動媒体から成るチャー混合物を、空気によって流動させながら前記未分解残渣を燃焼させるチャー燃焼手段により５００～９５０℃前後の熱エネルギを得ている。）を主として利用して前記略２００℃～３２０℃前後に一次加熱したボイラ水若しくは蒸気を二次～三次加熱して４００～５００℃の加熱蒸気（ボイラチューブ温度を約４５０～５５０℃）を得ても低級材でもチューブ腐触が生じる恐れがない。これによりごみ焼却による発電を行なった場合においても、塩素を殆ど含有しない重油やＬＮＧ等を燃料としたプラントと同様な３０～４０％の発電効率を低コストで得る事が出来る。

【０００７】

【発明が解決しようとする課題】かかる先願技術によれば熱分解炉とチャー燃焼炉及びボイラやスーパヒータを効率よく組合せる事により、塩素の低減ともに且つ高温度の過熱蒸気を得ることの出来るが、熱分解炉内に投入する生ごみを含む生活廃棄物には、水分を多く含んだものが存在し、前記熱分解炉で得られた熱分解ガスが、前記含水ごみよりの蒸発水分によって希釈され、カロリー低下が生じてしまい、灰溶融炉の温度を１３００℃以上にするために、熱分解ガス燃焼用空気源として、３０～５０％の酸素富化空気を用いる必要が生じ、酸素富加設備とその運転動力コストが大幅に増大する。本発明は、かかる先願技術の欠点を、解消することを目的とする。

【０００８】

【課題を解決するための手段】請求項１記載の発明は、前記加熱蒸気を製造するための熱エネルギーを得るための装置に関する発明で、温度３００℃以上の空間内に、流動媒体とともに廃棄物を供給して熱分解反応を行なわせ、その反応により発生した熱分解ガスと、未分解残渣および流動媒体から成るチャー混合物と、不燃物とを互いに分離する熱分解手段と、前記熱分解手段より導かれた未分解残渣および流動媒体から成るチャー混合物を、空気によって流動させながら前記未分解残渣を燃焼させるチャー燃焼手段とを含むことは前記先願技術と同様であるが、前記熱分解手段を、仕切壁により区分けされた複数の流動域を具えた流動床で形成するとともに、該流動床に供給された廃棄物が前記流動域を循環しながら熱分解を行う流動槽で形成したことを特徴とするものである。かかる発明によれば複数の流動域を順次廃棄物が循環する事により、処理物が出口にショートパスすることなく、十分なる熱分解と連続投入処理が可能となるとともに、流動化ガスの低減が可能となり熱分解ガスのカロリー低下を抑制することが出来る。

【０００９】さて前記図２の作用を達成するためには熱分解ガスとチャー混合物の熱カロリー比が「約７（熱分解ガス）：約３（チャー混合物）」になるように熱分解を行うことが好ましい。これは、加温すべきボイラ水を１００Ｋｇｆ／ｃｍ²前後に加圧してその沸点を３０９℃前後に設定している為に、熱分解ガスでは後記図１に示す水冷壁ボイラ３６及び第１のボイラ２７（両者を第１の蒸気製造工程（手段）という）でボイラ水を常温より「沸点３０９℃＋蒸発潜熱」言換えれば３０９℃で殆ど蒸気化するまで立上げるカロリーと、該立上げた蒸気を沸点３０９℃より５００℃まで立上げるカロリーの比は、約７：３である事による。従って前記発明によれば熱分解を十分に行う事が出来、これにより熱分解ガスの熱エネルギーは十分に大きくする事が出来る。

【００１０】尚、前記した通り生ごみを含んだ都市ごみ等の廃棄物を直接熱分解炉に投入すると熱分解ガスが水分で希釈されて、カロリー低下を招く。そこで請求項２記載の発明においては、１００～３００℃の温度で好ましくは酸素不足下で廃棄物を乾燥する手段と、温度３００℃以上の空間内に流動媒体とともに前記乾燥手段により乾燥された廃棄物を供給して熱分解反応を行なわせ、その反応により発生した熱分解ガスと未分解残渣および流動媒体から成るチャー混合物と不燃物とを互いに分離する熱分解手段と、前記熱分解手段より取り出された未分解残渣および流動媒体から成るチャー混合物を、空気によって流動させながら前記未分解残渣を燃焼させるチャー燃焼手段とを含み、前記乾燥手段を、仕切壁により区分けされた複数の流動域を具えた流動床で形成するとともに、該流動床に供給された廃棄物が前記流動域を循環しながら乾燥を行う流動槽で形成したことを特徴とするものである。

【００１１】尚前記都市ごみの乾燥温度は、３００℃以上で行うと炭化水素ガスが発生し好ましくなく、又１００℃以下では十分な蒸発が出来ない。又乾燥雰囲気は酸素不足下で低温燃焼が生じず、好ましい。従って、前記乾燥手段も熱分解手段と同様な構成で温度管理のみ行うような方策がよい。すなわち、例えば乾燥手段も熱分解手段と同様なチャー燃焼手段より得られた高温砂を利用して廃棄物の乾燥を行う流動床、キルン、横型撹拌槽のいずれかであるのがよく、これにより、熱エネルギーの有効利用が図れる。そして、前記熱分解工程に投入される廃棄物をチャー燃焼工程より得られた高温砂を利用して十分に乾燥させるのがよい。これにより前記課題の解決とともに、チャー燃焼工程より得られる高温砂は温度的にも又熱容量的にも十分なる大きさを有する為に、容易に乾燥が可能である。又本発明は前記乾燥手段を、仕切壁により区分けされた複数の流動域を廃棄物が循環し

ながら乾燥を行っている為に、請求項１記載の発明と同様な効果を有する。

【００１２】

【発明の実施の形態】以下、図面を参照して本発明の好適な実施例を例示的に詳しく説明する。但しこの実施例に記載されている構成部品の寸法、材質、形状、その相対的配置等は特に特定的な記載がないかぎりは、この発明の範囲をそれに限定する趣旨ではなく、単なる説明例にすぎない。図３は図１の本発明の実施例に係る廃棄物の焼却熱を利用した過熱蒸気製造装置び使用する夫々流動床からなる熱分解炉と乾燥炉を示し、いずれも多孔板等の分散板３－１上に流動砂等の流動媒体を堆積させて流動床を形成し、該流動床内を下降流と上昇流により回流可能に中央仕切板３－３により左右２つの流動域①、②に分割され、そして前記仕切り板３－３は流動床上部と底部が夫々開口されている。又、分散板３－１は不燃物出口９側に向け下向きに傾斜されており、前記仕切り板３－３により夫々仕切られる分散板３－１下方空間の底部には夫々燃焼排ガス供給ライン２５／６－１／６－２に接続された分岐ライン６Ａ／６Ｂが接続されており、そして該分岐ライン６Ａ／６Ｂには夫々不図示の流量調整弁が設けられ、仕切り板３－３により２分割される夫々の流動域①、②に供給される空気流を制御可能に構成される。

【００１３】すなわち分岐ライン６Ａの空気流量を分岐ライン６Ｂより少なくすることにより、又左側流動域部が下降流動域①となり、右側に位置する流動域は上昇流動域②とすることが出来る。具体的には下降流動域①のガス空塔速度は、０．０～０．３ｍ／ｓｅｃ、好ましくは０．０～０．２ｍ／ｓｅｃ、又上昇流動域②のガス空塔速度は、０．３～１．０ｍ／ｓｅｃ、好ましくは０．４～０．６ｍ／ｓｅｃに設定するのがよい。又分散板３－１の傾斜角度は５～４５° 好ましくは１０～４５° 前後に設定するのがよい。係るガス空塔速度や分散板３－１の傾斜角度等の構成は図２の熱分解炉も同様である。

【００１４】そしてかかる乾燥炉１Ｂ側の流動槽においては下降流動域①側の流動床上部に廃棄物供給ライン４を設け、該ライン４より都市ごみ等の廃棄物が、又その下側に、チャー燃焼炉１０の流動砂がサイクロン１８を介して戻入される分岐ライン５２の出口端を接続し、該ライン５２の出口端より６５０℃前後の高温の流動砂が夫々投入可能に構成される。

【００１５】そして前記上昇流動域②側の流動床上面には熱分解炉１Ａの下降流動域①側の流動床内に乾燥廃棄物が重力により投入可能に、熱分解炉１Ａ側に向けてに下向きに傾斜された傾斜出口ライン９－２を設ける。この際傾斜出口ライン９－２の熱分解炉１Ａ側の出口端は逆流防止とガスシールを兼ねるために、流動床の中に出口開口９－２ａを設けるのがよい。尚、流動媒体もその多くは傾斜出口ライン９より熱分解炉１Ａに投入されるが、該流動媒体中の金属等の不燃物の移送を行うために、前記上昇流動域②側の流動床底面の分散板３－１上に、ブッシャ若しくはスクリューコンベア９－３を介した移送ライン９－１を設けるのがよい。

【００１６】かかる乾燥炉１Ｂによれば燃焼排ガス入口ライン６－２より分岐ライン６Ａ／６Ｂを介して夫々供給された燃焼排ガス等（本乾燥炉は基本的には酸素不足下の乾燥の為に、供給されるガスは酸素を消費した燃焼排ガスが大部分である。）により、ライン４よりの都市ごみ等の廃棄物と、ライン５２よりの６５０℃前後の高温の流動砂とが流動床内で下降流動域①と上昇流動域②による循環流動を繰り返しながら温度１００～３００℃、好ましくは１００～２５０℃の循環流動床空間を生成し、廃棄物の乾燥を行なわせ、図１に示すようにその蒸発により発生した湿気ガスは出口ライン７２より流量調整弁５７を介してボイラ３６が収納された熱分解ガス燃焼炉３０Ｂに導入され、一方乾燥した廃棄物は流動砂とともに下向きに傾斜された傾斜出口ライン９－２より重力により熱分解炉１Ａに投入される。又流動媒体の一部は、不燃物排出ライン８よりフィルタ８０により大型不燃物を除去した後、その残余の流動媒体をバケットコンベア等からなる戻入ライン５を介して乾燥炉１Ｂ又はチャー燃焼炉１０に戻入され流動媒体の循環制御を行う。

【００１７】一方前記乾燥廃棄物および流動砂が導入される熱分解炉１Ａは、前記乾燥炉１Ｂと同様に、下降流動域①側の流動床内に、サイクロン１８を介してチャー燃焼炉１０の砂戻入用分岐ライン５１を開口し、該ライン５１より６５０℃前後の高温の流動砂が投入可能に構成する。そして前記上昇流動域②側の流動床上面にはチャー燃焼炉１０の流動床内にチャー混合物が重力により投入可能に、チャー燃焼炉１０側に向けて下向きに傾斜された傾斜出口ライン９を設ける。

【００１８】この際熱分解炉１Ａの分散板３－１上に溜まった不燃物は、前記上昇流動域②側の流動床底面の分散板３－１上に不燃物排出ライン８を設け、該ライン８経路途中に配したフィルタ８０に大型不燃物を除去した後、その残余のチャー混合物はバケットコンベア等からなる戻入ライン５を介して乾燥炉１Ｂ又はチャー燃焼炉１０に戻入されるよう構成する。尚、大型不燃物を除去した後のチャー混合物は既にフィルタ８０等の熱接触により１５０℃以下冷却されているために、必ずしも後記する気流搬送手段で構成する必要はなく通常のバケットコンベアでよい。

【００１９】図４は、４室構造の熱分解炉（乾燥炉も同一構成の為、乾燥炉側の構造の説明は省略する。）の構成を示し、流動槽を仕切板にて十文字状に仕切り、「田」の字状に４つの流動域空間①～④を形成するとともに、左端の熱分解炉１Ａの下降流動域①の入口側壁には廃棄物供給ライン４とチャー燃焼炉１０の高温流動砂

が戻入される分岐ライン５２の出口端が接続され、右端の上昇流動域④出口壁にはチャー燃焼炉１０側に向けて下向きに傾斜された傾斜出口ライン９と、前記上昇流動床底面の分散板３－１上に不燃物排出ライン８（８Ａ，８Ｂ）を夫々設けている。そして分散板３－１は、前記ライン８、９を設けた①の流動域側から②の流動域側に向けて下向きに第一の分散板３－１Ａを、又③の流動域側から④の流動域側に向けて下向きに第二の分散板３－１Ｂを夫々配し、更に②の流動域側から③の流動域側に、又④の流動域側から①の流動域側に夫々オーバフロー可能に、仕切り板３－３Ａ、３－３Ｂ高さを設定する。

【００２０】更に前記した如く①及び③の分岐ライン６Ａの空気流量を、②及び④の分岐ライン６Ｂより少なくすることにより、又①及び③の流動域部が下降流動域となり、②及び④の流動域は上昇流動域とすることが出来る。又第一及び第二の分散板３－１Ａ、３－１Ｂの下向き側終端位置にある②及び④の上昇流動域側の分散板３－１上の側壁に夫々不燃物排出ライン８Ｂ、８Ａを設ける。尚乾燥炉の場合は前記不燃物排出ライン８Ｂ、８Ａの代りに、ブッシャ若しくはスクリューコンベア９－３を介した移送ライン９－１を設ける。又④の上昇流動域側の流動床上面にはチャー燃焼炉１０の流動床内にチャー混合物が重力により投入可能に、チャー燃焼炉１０側に向けて下向きに傾斜された傾斜出口ライン９を設ける。

【００２１】かかる熱分解炉１Ａによれば、分岐ライン６Ａ／６Ｂを介して夫々供給された燃焼排ガス等により、①及び③の流動域部が下降流動域となり、②及び④の流動域は上昇流動域となり、①の下降流動域内にライン９よりチャー物混合物が、又チャー燃焼炉１０の砂が循環戻入するライン５１より６５０℃の高温の流動砂が夫々投入されと、①→②→③→④→①の順で３５０～５００℃の下降流と上昇流を繰り返し循環する流動域空間が形成され、該流動域空間内で乾燥廃棄物の熱分解反応を行なわせ、その反応により発生した熱分解ガスは熱分解ガス出口ライン７１より灰溶融炉３１に、又未分解残渣および流動砂から成るチャー混合物はチャー混合物取り出しライン９よりチャー燃焼炉１０に、又不燃物は不燃物取り出しライン８より、夫々互いに分離して取り出すことが出来る。

【００２２】図５は図３に示す熱分解炉と乾燥炉を一体構造とした変形例で、図上左方より右方に向け順次、乾燥炉の下降流動域、上昇流動域、熱分解炉の下降流動域①上昇流動域②が配設され、左端の乾燥炉の下降流動域①の入口側壁には廃棄物供給ライン４とチャー燃焼炉１０の高温流動砂が戻入される分岐ライン５２の出口端が接続され、右端の熱分解炉の上昇流動域①、②出口壁にはチャー燃焼炉１０側に向けて下向きに傾斜された傾斜出口ライン９と、前記上昇流動床底面の分散板３－１上に不燃物排出ライン８を夫々設けている。そして分散板３－１は、乾燥炉１Ｂの上昇流動域②側から熱分解炉１Ａの下降流動域①側に向けて下側に向け傾斜させて一連で配設され、更に乾燥炉１Ｂの上昇流動域②側と熱分解炉１Ａの下降流動域①間に配設した仕切板３３は分散板３－１上方を開口３３ａさせるとともに、該仕切板３３上端を熱分解炉１Ａの下降流動域①側に開口し、その開口部３３ａに矩形状（逆Ｌ字状）の出口ライン９２を設け、その底部を熱分解炉１Ａの下降流動域①内に開口する事により、乾燥後の廃棄物は流動砂とともにきに出口ライン９２より重力により熱分解炉１Ａの下降流動域①内に投入される。尚前記出口ライン９２より流動砂は乾燥炉１Ｂ内の熱交換により、既に温度低下してるために、チャー燃焼炉１０の砂戻入用分岐ライン５１を熱分解炉１Ａの下降流動域①上に開口し、該ライン５１より６５０℃前後の高温の流動砂が投入可能に構成するのがよい。

【００２３】図１及び図６、７は本発明の実施例に係る廃棄物の焼却熱を利用した過熱蒸気製造装置を示し、図１はその全体図、図６、７は乾燥炉と熱分解炉、及びチャー燃焼炉を示す要部構成を示す正面図と平面図である。尚本図の乾燥炉と熱分解炉は図３と同様であるのでその説明は省略する。流動床炉からなるチャー燃焼炉１０は、図６、７に示すように、底部に不燃物出口部側に向け下向きに傾斜させて配した分散板１１頂部側の流動床内にチャー混合物導入ライン９と流動媒体取り出しライン１６０を夫々接続するとともに、前記導入ライン９より導入されたチャー混合物からなる主流動床１０Ａの分散板１１の傾斜下方側部に仕切壁１０Ｃを介して副流動床１０Ｂを形成する。そして前記分散板１１下方の空気供給ライン１２より主流動床１０Ａと副流動床１０Ｂに夫々空気が供給されて、先ず主流動床１０Ａ内で６００～７５０℃に加熱して未分解残渣の燃焼を行い、更に主流動床１０Ａと仕切壁１０Ｃを介して隣接している副流動床１０Ｂとの間で未分解残渣の燃焼と流動砂が循環するように構成し、そして前記副流動床（副チャー燃焼部）１０Ｂの流動媒体内に第３スーパヒータ２９－２を配設し、チャー燃焼炉１０の上方域に配設された第２スーパヒータ２９－１とライン４０を介して接続している。尚、主流動床１０Ａも前記図２と同様に下降流動域①と上昇流動域②で循環するように構成してもよい。

【００２４】尚、チャー燃焼炉１０上方に配設された第２スーパヒータ２９－１は、第１スーパヒータ２８よりライン２８－１を介して導入された過熱蒸気の過熱とともに、９５０～１３００℃前後と無用に高くなった燃焼ガスを約８５０℃に落とす役目を、又チャー燃焼炉１０上方ダクト域にはボイラ３６－２が配設され、無用に高くなった燃焼ガスを落とす役目をする。尚前記のように燃焼ガス温度を約８５０℃に落としても第１スーパヒータ２８における蒸気温度を４００～５２０℃に維持する

上で何の支障もない。

【００２５】そして前記チャー燃焼炉１０で燃焼されない小型の不燃物は不燃物取り出しライン１４より取り出され、そして前記不燃物取り出しライン１４には網目が２ｍｍ前後の第２フィルタ１４０が介装され、前記ライン１４より排出された排出物について小型不燃物と流動砂・灰分とを分離し、前記バケットコンベア等のライン５／５－１／５－２より流動砂を乾燥炉１Ｂの流動床下降流動域①又はチャー燃焼炉１０に給送するように構成している。さて前記チャー燃焼炉１０内の流動媒体は出口通路より気流搬送機構１６に導かれ、該搬送機構１６で空気流による搬送力が付与された後、ライン１７を介して気・固分離装置例えばサイクロン１８に導入され、ここで流動媒体と高温空気流に分離され、高温空気流は灰溶融炉３１に、高温流動媒体は分岐弁５０、分岐ライン５１，５２を介して夫々乾燥炉１Ｂと熱分解炉１Ａに戻入される。

【００２６】前記チャー燃焼炉１０内の流動媒体出口ライン１６０側に設けた気流搬送機構で、前記サイクロン１８に通じる垂直通路部１６１の底側側壁に前記出口ライン１６０の終端と連設する水平通路部１６２を設け、前記垂直通路部１６１の底面より２０～２００℃前後の常圧空気流を連続的に、又水平通路部１６２側端より２０～２００℃前後の３～６Ｋｇｆ／ｃｍ²の圧縮空気流を間欠的に夫々送給する。そして前記流動媒体と空気流の固気重量比を、（砂／空気）：１／１～５／１に設定する事により前記流動媒体をサイクロンまで円滑に搬送できる気流搬送力を得る事が出来る。

【００２７】灰溶融炉３１は、該灰溶融炉３１内に前記サイクロン１８を介してチャー燃焼炉よりの高温空気及びラインを介して熱分解炉よりの熱分解ガスが導入され、更に徐塵バグフィルタ３７より取り出したダスト２９及び／又はチャー燃焼炉１０よりの不燃分をライン３０より気流を介して導入して、例えば旋回流により灰を旋回分離させながら、前記高温空気と熱分解ガスとの燃焼熱により１３００℃以上として前記ダスト２９や不燃分を溶融して、該溶融した灰分を溶融灰出口ラインを介して不図示の水貯溜部に落下させ、数ｍｍ程度の水冷スラッグを生成し、又は空冷により除冷し、該スラッグを建築用骨材として利用するように構成する。又、前記灰溶融炉３１の上方域には熱分解ガス燃焼炉３０Ｂが配設され、該熱分解ガス燃焼炉３０Ｂ内に配設した水冷壁ボイラ３６の加熱を行い沸点２００～３０９℃近くまで立上げる蒸気／ボイラ水を製造する。

【００２８】図１に戻り、２０は第１スーパヒータ２８及びボイラ２７が配設された熱交換塔で、該熱交換塔２０頂部に灰溶融炉３１よりの燃焼ガス及び第２スーパヒータ２９－１を介してチャー燃焼炉１０よりの燃焼ガスが夫々導入され、先ず第１スーパヒータ２８での加熱によりガス温度を落とした後、第１ボイラ２７の加熱を行う。この結果、第１ボイラ２７でボイラ水入口２６より取込んだボイラ水を３００℃前後に加熱し、第１ボイラ出口ライン２５より第１スーパヒータ２８に蒸気若しくは加熱水を供給する。ボイラ水は分岐ライン２６’、２６’’を介してチャー燃焼炉１０のボイラ３６－２及び灰溶融炉３１のボイラ３６にも導入され分岐ライン２５’、２５’’を介して第１スーパヒータ２８に蒸気若しくは加熱水を供給する。

【００２９】尚、１００Ｋｇｆ／ｃｍ² 前後に加圧してその沸点を３０９℃前後に設定している前記ボイラ水はボイラ２７、３６、３６－２に導入されて第１段階の加熱を行うわけであるが、その加熱温度が前記沸点近くの３０９℃前後になるようにその通水量を制御している。この結果、前記各ボイラ３６、３６－２、２７のチューブ表面壁温度は、前記加温水に追従して３０９℃前後に維持でき、例え熱交換される熱分解ガスに塩素若しくはＨＣｌを含んでいても低級材で腐食が生じる事はない。

【００３０】第１スーパヒータ２８では前記各ボイラ３６、３６－２、２７の出口ライン２５、２５’、２５’’より取り出した蒸気／加熱水を導入して、前記８５０℃前後の燃焼ガスにより過熱蒸気を製造し、以下蒸気出口ライン２８－１より第２スーパヒータ２９－１に、更にライン２８－２より第３スーパヒータ２９－２に夫々直列若しくは並列に導入して４００～５５０℃に過熱された過熱蒸気を取り出し、発電機に送給する。

【００３１】次に前記実施例の作用を簡単に説明するに、乾燥炉１Ｂには前記したチャー燃焼炉１０から出口ライン１６０、気流搬送機構１６、ライン１７、サイクロン１８及び分岐ライン５１／５２を通して気流搬送により６００～７００℃、具体的には６５０℃の循環流動砂が供給され、一方廃棄物供給ライン４から都市ごみ等の含水廃棄物が供給され、更に下部の空気または燃焼排ガス入口ライン６－２から燃焼排ガスに僅かな温度調整用空気を供給して流動砂を流動させた流動床内で下降流と上昇流とにより循環流動させながら、乾燥炉１Ｂ内温度を１００～３００℃に維持して乾燥を行った後、乾燥後の廃棄物および流動砂から成る乾燥廃棄物混合物はライン９－２より熱分解炉１Ａに導入される。又前記乾燥炉１Ｂ内での乾燥により発生した湿気ガスは出口ライン７２よりボイラ３６が収納された灰溶融炉３１上方の熱分解ガス燃焼炉３０Ｂに導入され、熱分解ガス燃焼炉３０Ｂ内の燃焼ガス温度を８５０℃前後に制御する。

【００３２】さて前記都市ごみ等の廃棄物中には塩ビプラスチック等の含塩素有機化合物が混入しており、可燃分中にＣｌとして約０．２～０．５％含有されている。そしてライン９－２から乾燥廃棄物混合物、前記分岐ライン５１から６００～７００℃の循環流動砂をそれぞれ熱分解炉１Ａに供給し、下部の空気または燃焼排ガス入口ライン６－２から燃焼排ガスに僅かな温度調整用空気を供給して流動砂を流動させた流動床内で下降流と上昇

流とにより循環流動させながら、温度３５０～５００℃で処理することにより、下向きに傾斜させたチャー混合物取り出しライン９からは実質的に塩素を含有しない未分解残渣が得られる。

【００３３】すなわち、廃棄物中に含まれていた塩素は、実質的に全て熱分解ガスに含まれて、熱分解ガス出口ライン７１に排出されることになる。なお、熱分解炉１Ａ内の熱分解反応で分離された大型の不燃物は、不燃物取り出しライン８からフィルタ８０を介して装置外に排出される。また前記熱分解炉１Ａにより得られた熱分解ガスは灰溶融炉３１にライン７１を介して供給する。

【００３４】これによりライン７１の熱分解ガスは湿気ガスで希釈されないので高カロリガスとなり、灰溶融炉３１ではサイクロン１８を介してチャー燃焼炉の流動砂から分離された５００～６００℃の高温空気により燃焼されて灰溶融炉３１の温度を容易に１３００～１５００℃にすることが出来る。

【００３５】一方熱分解炉１Ａでチャー混合物取り出しライン９から取り出された流動砂と未分解残渣から成り、実質的に塩素を含有しないチャー混合物は、燃焼炉１０の下部に供給され、空気供給ライン１２から分岐ライン１２－１、１２－２、及び分散板１１を介して供給される空気によって燃焼させることにより６００～７５０℃に上昇させて流動砂を流動させながら未分解残渣を燃焼させる、更に完全燃焼のために空気供給ライン６３から更に空気を供給することにより燃焼炉１０の温度は燃焼発熱反応によって上昇する。この温度値は、チャー混合物取り出しライン９から供給される未分解残渣の発熱量と空気供給ライン１２、６３の空気および砂循環ライン１９の流動砂の量と温度によって決まるが、１０００～１３００℃前後の高温になる場合がある。そこでチャー燃焼炉１０ではボイラ３６－２を配設し、該ボイラ３６－２との熱交換により８５０℃前後に制御した後、実質的に塩素を含有しない燃焼ガスをライン４０を介して第２スーパヒータ２９－１と熱交換した後、ライン１５を介して熱交換塔２０に導入される。

【００３６】一方本実施例は、図１、図６に示すように前記チャー燃焼炉１０に第３スーパヒータ２９－２を設けた副チャー燃焼部１０Ｂを付設させており、チャー燃焼炉１０での流動媒体を第３スーパヒータ２９－２による奪熱により６００～７５０℃に落とし、該６００～７５０℃に落とした流動媒体をライン１６０、気流搬送機構１６、サイクロン１８及び分岐ライン５１／５２を介して５００～６５０℃の流動砂を熱分解炉１Ａ及び乾燥炉１Ｂに戻入する事が出来、この結果前記熱分解炉１Ａ内の熱分解温度を３５０℃から５００℃、乾燥炉１Ｂ温度を１００～２５０℃前後に安定して制御が可能である。尚、前記副チャー燃焼部１０Ｂには第３スーパヒータ２９－２が内装されており、これによりチャー燃焼温度の安定化に役立つ。

【００３７】前記灰溶融炉３１では、前記したように前記熱分解ガス／高温空気とともに、徐塵バグフィルタ等より分離された灰が導入され、前記熱分解ガスの燃焼エネルギーにより灰分を溶融して、該溶融した灰分を不図示の水貯溜部に落下させ、数ｍｍ程度の水冷スラッグを生成し、又は空冷で除冷し、該スラッグを建築用骨材として利用する。又、前記灰溶融炉３１上方域には熱分解ガス燃焼炉３０Ｂが配設され、ライン６２より前記未燃焼熱分解ガスに十分な空気を供給して該熱分解ガス及び乾燥炉１Ｂよりの湿気ガスの更なる完全燃焼を行う。この結果熱分解ガス燃焼炉３０Ｂ内の温度を８５０℃前後に維持できるために、ボイラ３６に導入されたボイラ水を沸点２００～３０９℃近くまで温度上昇させた蒸気／ボイラ水を多量に製造できる。

【００３８】一方灰溶融炉３１から取り出された８５０℃前後の高温排ガスは、実質的に塩素を含有していないチャー燃焼炉１０よりの燃焼ガスにより希釈され、該希釈された燃焼ガスは熱交換塔２０に導入され、第１ボイラ２７及び水冷壁ボイラ３６で製造された２００～３２０℃前後の蒸気／ボイラ水を第１スーパヒータ２８で加熱して過熱蒸気とするために用いられる。灰溶融炉３１を経て来た排ガスは燃焼により又チャー燃焼炉１０よりの燃焼ガスとの混合により希釈されているので、第１スーパヒータ２８のボイラチューブ表面温度を３５０℃以上としても高温腐食は軽減されるが、第１スーパヒータの負荷は極力小さくするのが好ましい。

【００３９】次に、熱交換塔２０内では、各ボイラ３６、３６－２、２７により沸点２００～３０９℃近くまで温度上昇させた蒸気／ボイラ水が第１スーパヒータ２８に導入され、一方熱交換塔２０頂部に導入された８５０℃前後の燃焼ガスが第１スーパヒータ２８を加熱し、過熱蒸気を得ることができる。尚、前記熱分解ガス燃焼炉３０Ｂ内に導入されるガスにはＨＣｌが約５００～１０００ppm含まれているので、ボイラ水の流量を調整してボイラ３６のチューブ表面温度は従来並みの約３５０℃以下として、高温腐食を抑制する。このためボイラ３６では高温の過熱蒸気は得られないが、約２００～３２０℃までは加熱できるので、これを更に第１スーパヒータ２８以降のスーパヒータ２９－１、２９－２で加熱すれば、約４００～５５０℃の高温の過熱蒸気を得ることができる。

【００４０】そして熱交換塔２０通過後の燃焼排ガスは、徐塵用バグフィルタ３７でダスト除去後、脱塩素バグフィルタ３８で脱塩した後、その大部分は大気排出されるが、一部はライン２５を前記乾燥炉１Ｂと熱分解炉１Ａに供給される。又徐塵用バグフィルタ３７で除去されたダストは灰溶融炉に供給される。尚、前記ライン２５を流れる排ガスは酸素が３～４％でその温度は１５０℃前後である。

【００４１】

13

【発明の効果】以上記載のごとく、請求項１記載の発明によれば複数の流動域を順次廃棄物が循環する事により、十分なる熱分解と連続投入処理が可能となる。

【００４２】請求項２記載の発明によれば、前記熱分解手段に投入される廃棄物を乾燥手段で十分に乾燥させている為に、熱分解ガスのカロリのバラツキが生じる事なく、高カロリの且つ安定した熱分解ガスが得られる。又請求項３記載の発明によれば、前記乾燥手段を仕切壁により区分けされた複数の流動域を廃棄物が循環しながら乾燥を行っている為に、請求項２記載の発明の効果の一層の促進が図れる。

【図面の簡単な説明】

【図１】本発明の実施例に係る廃棄物の焼却熱を利用した過熱蒸気製造装置を示す系統図である。

【図２】本発明の基本構成に係る廃棄物の焼却熱を利用した過熱蒸気の製造手順を示すグラフ図である。

【図３】図１の乾燥炉と熱分解炉を示し、（Ａ）は平面図、（Ｂ）は正面図である。

【図４】流動域が「田」の字状に４分割した熱分解炉を示し、（Ａ）は平面図、（Ｂ）～（Ｄ）は夫々Ａ－Ａ線、Ｂ－Ｂ線、Ｃ－Ｃ線断面図である。

【図５】乾燥炉と熱分解炉を一体化した図３の変形例を＊示す乾燥炉と熱分解炉を示し、（Ａ）は平面図、（Ｂ）は正面図である。

14

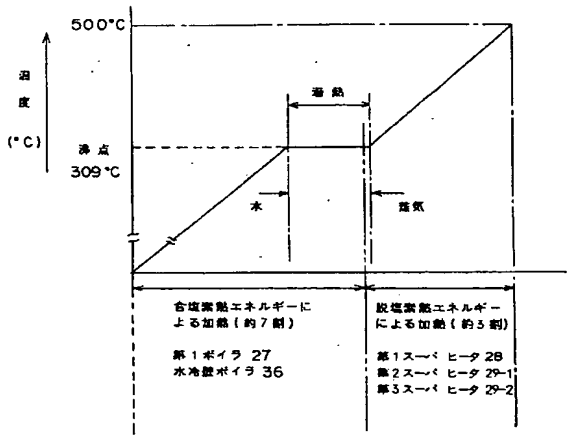
【図６】図１の乾燥炉と熱分解炉、及びチャー燃焼炉を示す要部構成を示す正面図である。

【図７】図１の乾燥炉と熱分解炉、及びチャー燃焼炉を示す要部構成を示す平面図である。

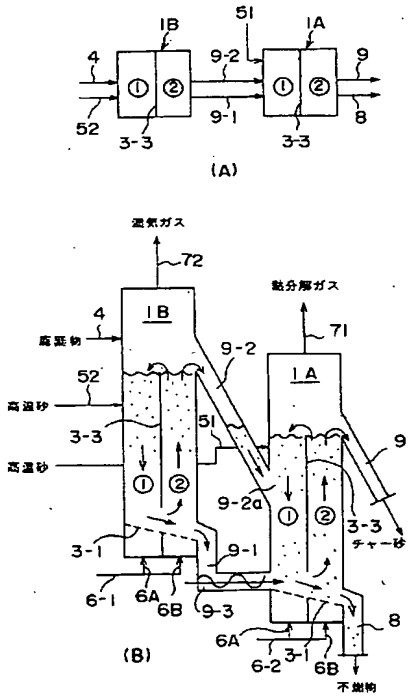
【符号の説明】

１Ａ	熱分解炉
１Ｂ	乾燥炉
１０	チャー燃焼炉
１０Ａ	主チャー燃焼部
１０Ｂ	副チャー燃焼部
１６	気流搬送機構
１８	サイクロン
２０	熱交換塔
２７、３６、３６－２	ボイラ（第１の蒸気製造手段）
２８、２９－１、２９－２	スーパヒータ（第２の蒸気製造手段）
３１	灰溶融炉
３７、３８	バグフィルタ

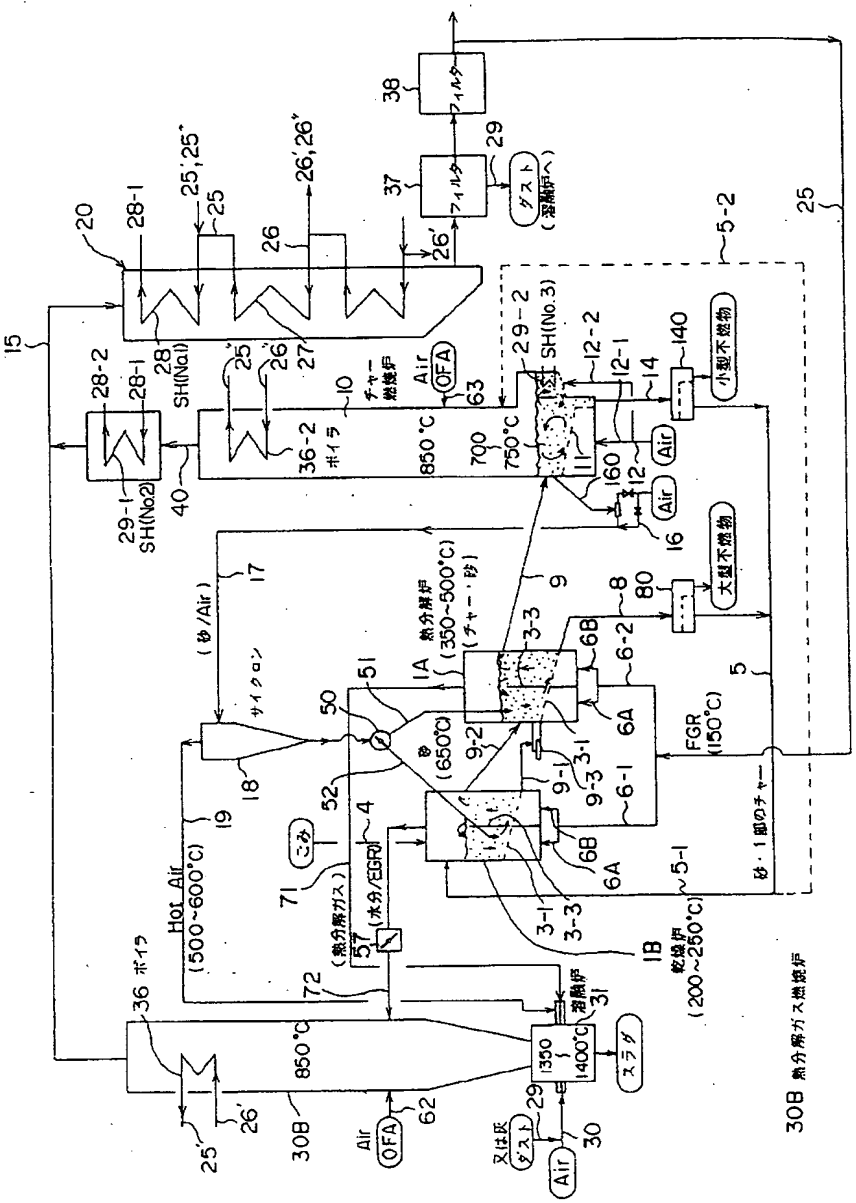
【図２】



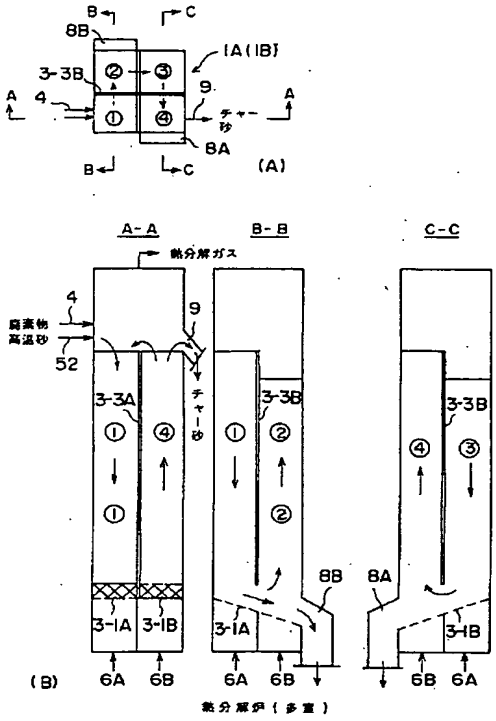
【図３】



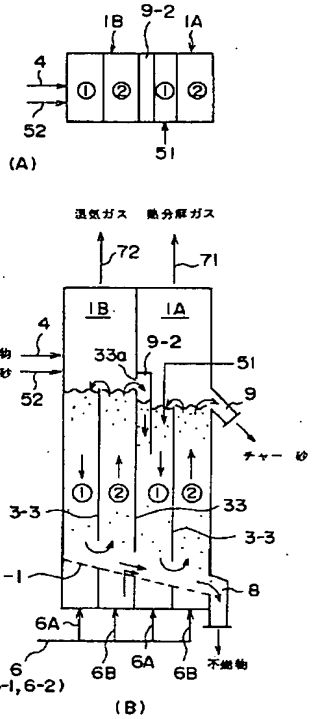
【図１】


プロセスフロー
熱分解ガス燃焼炉
乾燥炉
(200~250°C)
熱分解炉
(350~500°C)
(チャー・砂)
Hot Air
(500~600°C)
FGR
(150°C)
(水分/EGR)
(熱分解ガス)
(砂/Air)
サイクロン
ごみ
スラグ
Air
OFA
ボイラ
チャー燃焼炉
溶融炉
1350
1400°C
850°C
700
750°C
SH(No.1)
SH(No.2)
SH(No.3)
フィルター
ダスト
小型不燃物
大型不燃物
砂・1部のチャー

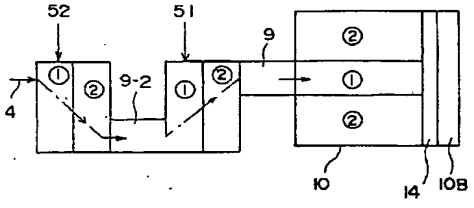
【図４】


B
C
8B
1A(1B)
3-3B
9
4
A
チャー砂
8A
(A)
A-A
B-B
C-C
熱分解ガス
廃棄物
高温砂
52
3-3A
3-3B
3-1A
3-1B
8B
8A
6A
6B
(B)
熱分解炉（多室）

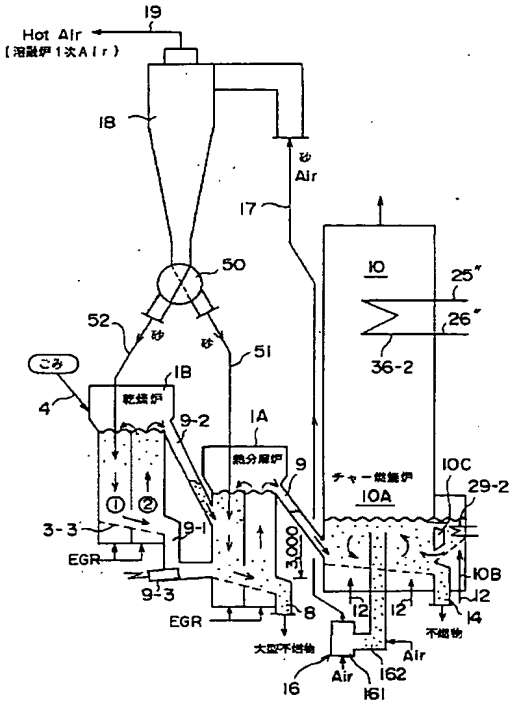
【図５】


1B
9-2
1A
4
52
51
(A)
還元ガス
熱分解ガス
72
71
33a
9
チャー砂
3-3
33
3-1
8
6A
6
(6-1,6-2)
6B
不燃物
(B)

【図７】


52
51
9
9-2
4
10
14
10B

【図６】



【手続補正書】
【提出日】平成８年１１月１３日
【手続補正１】
【補正対象書類名】明細書
【補正対象項目名】図面の簡単な説明
【補正方法】変更
【補正内容】
【図面の簡単な説明】
【図１】本発明の実施例に係る廃棄物の焼却熱を利用した過熱蒸気製造装置を示す系統図である。
【図２】本発明の基本構成に係る廃棄物の焼却熱を利用した過熱蒸気の製造手順を示すグラフ図である。
【図３】図１の乾燥炉と熱分解炉を示し、（Ａ）は平面図、（Ｂ）は正面図である。
【図４】流動域が「田」の字状に４分割した熱分解炉を示し、（Ａ）は平面図、（Ｂ）は夫々Ａ－Ａ線、Ｂ－Ｂ線、Ｃ－Ｃ線断面図である。
【図５】乾燥炉と熱分解炉を一体化した図３の変形例を示す乾燥炉と熱分解炉を示し、（Ａ）は平面図、（Ｂ）は正面図である。
【図６】図１の乾燥炉と熱分解炉、及びチャー燃焼炉を示す要部構成を示す正面図である。
【図７】図１の乾燥炉と熱分解炉、及びチャー燃焼炉を示す要部構成を示す平面図である。
【符号の説明】

１Ａ	熱分解炉
１Ｂ	乾燥炉
１０	チャー燃焼炉
１０Ａ	主チャー燃焼部
１０Ｂ	副チャー燃焼部
１６	気流搬送機構
１８	サイクロン
２０	熱交換塔
２７、３６、３６－２	ボイラ（第１の蒸気製造手段）
２８、２９－１、２９－２	スーパヒータ（第２の蒸気製造手段）
３１	灰溶融炉
３７、３８	バグフィルタ

フロントページの続き

(72)発明者　保田　静生
横浜市中区錦町12番地　三菱重工業株式会社横浜製作所内

(72)発明者　川見　佳正
横浜市中区錦町12番地　三菱重工業株式会社横浜製作所内